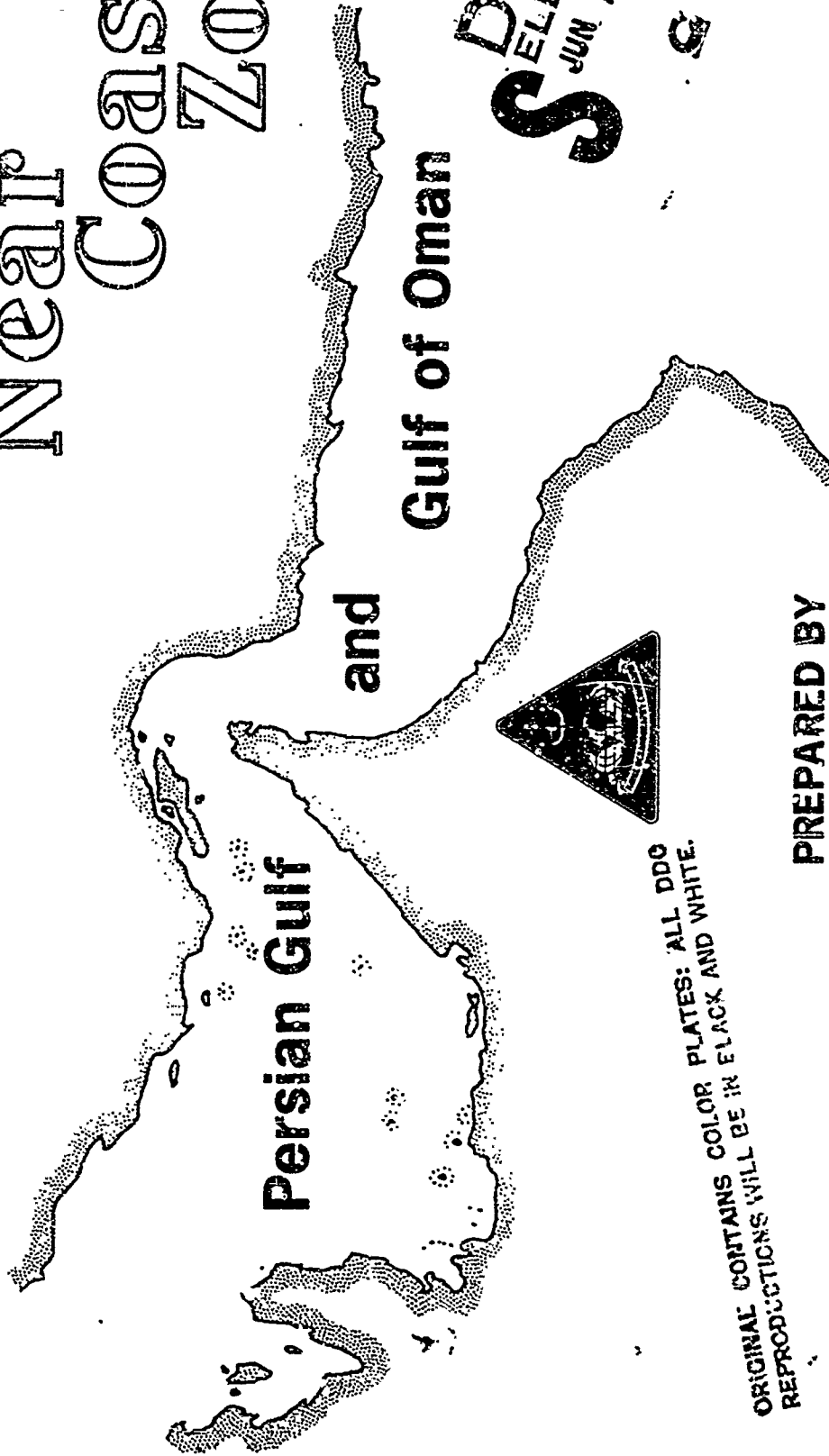


Climatic Study of the

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# Near Coastal Zone



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PREPARED BY  
NAVAL OCEANOGRAPHY COMMAND DETACHMENT, ASHEVILLE, N.C.  
FOR THE  
COMMANDER NAVAL OCEANOGRAPHY COMMAND

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CLIMATIC STUDY OF THE NEAR COASTAL ZONE, PERSIAN GULF AND THE GULF OF OMAN

CAUTION: WHEN USING THE WAVE HEIGHT CHARTS BE ADVISED THAT COMBINED WAVE AND  
SWELL SEA VALUES MAY BE SIGNIFICANTLY HIGHER.

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Climatology, visibility, ceiling, surface wind, air and sea temperature, wave heights, surface currents, monthly climatology, coastal zone.		
LESS THAN, GREATER THAN OR EQUAL		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
This climate study consists of monthly charts and tables of (1) visibility, (2) ceiling-visibility (low), (3) ceiling-visibility (mid-range), (4) scalar mean wind speed, (5) wind speed (11 and 34 kts), (6) wind speed 11-21 and 22-33 kts, (7) surface wind roses, (8) air and sea temperature, (9) wave height isopleths, (10) wave height tables and (11) surface currents (seasonal).		

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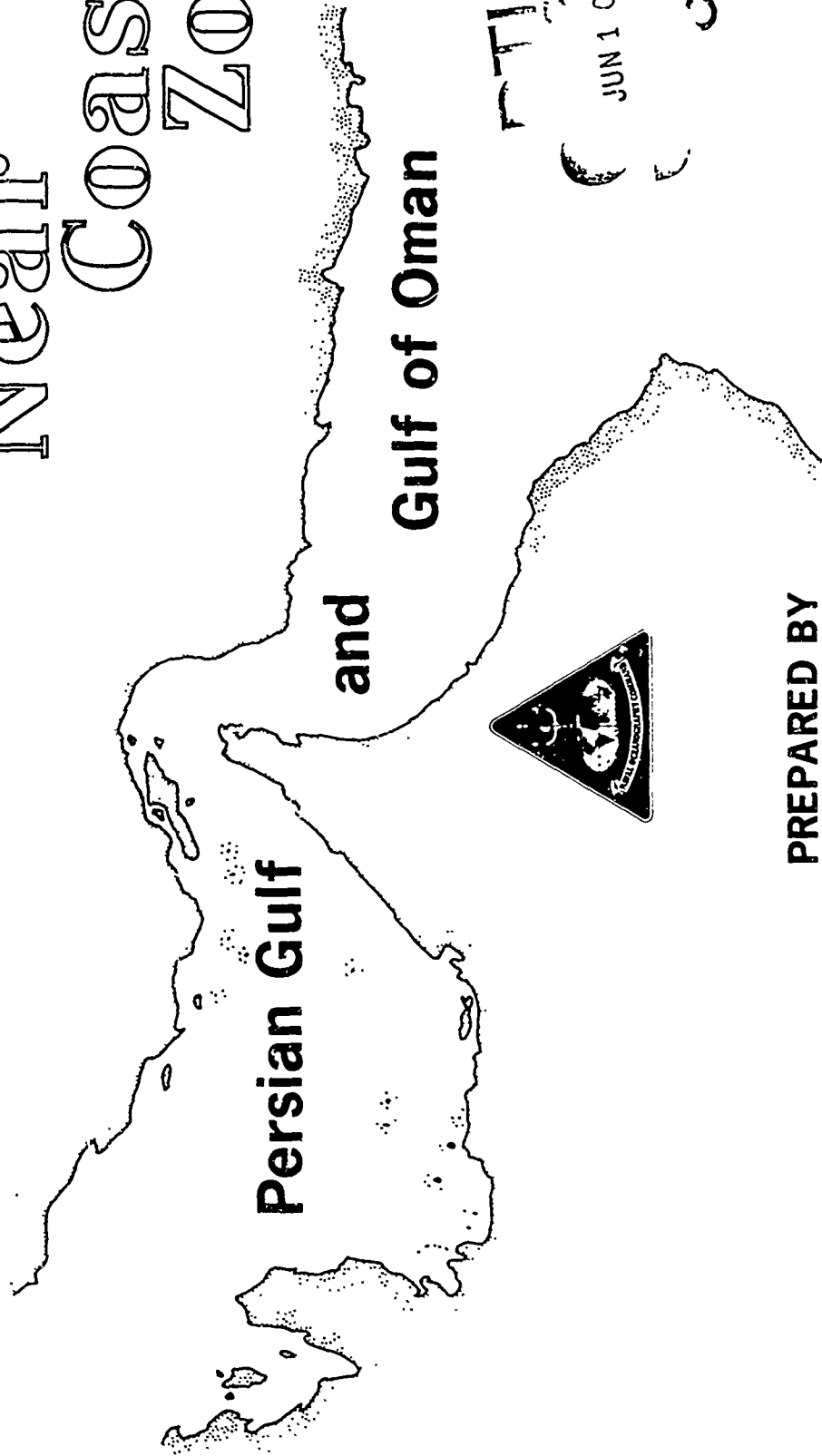
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# Climatic Study of the

# Near Coastal Zone



Persian Gulf

and

Gulf of Oman



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PREPARED BY  
NAVAL OCEANOGRAPHY COMMAND DETACHMENT, ASHEVILLE, N.C.  
FOR THE  
COMMANDER NAVAL OCEANOGRAPHY COMMAND

## Climatic Study of the Persian Gulf and Gulf of Oman

This atlas was prepared for the Commander, Naval Oceanography Command as a planning aid. The work was directed by the Naval Oceanography Command Detachment (NOCD) and performed by the National Climatic Center (NCC) in Asheville, NC. Appreciation is expressed to the staff of the NOCD and the Applied Climatology and Computer Support Branches of the NCC for the interagency effort in preparing this publication.

The study covers the marine area of southwest Asia within 20-28N and 50-63E, and presents surface marine statistics on monthly charts in the forms of isopleth maps, tables and graphs by one-degree area. Environmental parameters analyzed are winds, visibility, ceiling, air and sea temperatures, waves, and currents. The 154,000 surface marine observations used in computing the statistics were taken from NCC's Tape Data Family 11 (TDF-11) containing data collected by ships of various registry traveling through the study area from 1864 to 1979. Over 80 percent of the data was collected over the past 40 years. The sea surface current information was extracted from Naval Oceanographic Office Special Publication 1404-In 1, Surface Currents for Northwest Indian Ocean Including the Arabian and Laccadive Seas.

The 154,000 TDF-11 observations, compiled for a slightly larger area (18-30N, 47-65E), were subjected to thorough computer and visual quality control to eliminate duplicate observations and to exclude or adjust erroneous elements detected during internal consistency and extreme value checks. Element statistics (with observation counts) for each of the 93 one-degree marine squares for each month were then computed and plotted on maps. About 55 of these squares appear on the final published charts. Meteorologists drew isopleths (lines connecting points of equal magnitude) on 156 maps, making subjective adjustments when data biases or insufficient observations were evident. Consistency checks were also performed on monthly patterns for each element and between elements as well as comparative checks with other marine atlases and publications. The user may consider the isopleth analyses to be a good approximation of the climate over open water, but should exercise caution when interpreting the gradients and patterns over the relatively data-sparse zone immediately adjacent to the coast.

The graphs and tables represent the objective compilation of available data; they were not adjusted for suspected biases, and differences may be found when comparing the graphic data with isopleth analyses. The total number of observations for a given one-degree square should always be considered when interpreting the data, as there may be an insufficient number to permit representative statistics. In such

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### Sea Temperature

Sea surface temperatures are recorded with a fairly high frequency in marine observations. The two principal sampling methods are by sea water intake thermometer and by bucket thermometer. Although intake values may at times be a few tenths of degree Celsius higher than bucket values, the depth of the intake port partially offsets this; overall, the data can be used with considerable confidence.

### Visibility

Although visibility forms one of the most important weather elements in marine navigation, it is difficult to measure at sea because of the lack of reference points. Appearance of the horizon is usually the only basis for estimating visibility on the high seas and, because of the curvature of the earth, it is virtually impossible to see 25 miles horizontally from the bridge of most ships. The 10-category marine code, however, is coarse enough to permit experienced observers to provide useful information, particularly when the data are summarized climatologically. Systematic biases seem to occur primarily in the form of missed observations of low visibility. This occurs in fog or foul weather conditions when traffic is heavy enough to force the observing officer to forsake recording an observation because of navigational responsibilities.

### Ceiling

Cloud observations from ships are visual estimates. The type and amount of cloud can be observed rather easily during daylight. However, estimating the height of the cloud base, or ceiling, is quite difficult and cannot be considered very accurate. Since an "aircraft" type ceiling value is not available, the ceiling is estimated as the height of the low clouds when low clouds cover more than half of the sky. Total sky obscurations are considered to be ceilings, and total obscurations of the surface level are considered zero ceiling.

### Waves

Wave data from ships are predominately visual estimates, with watches or stopwatches very rarely used to estimate period. Suitable quantitative wave estimates are available only for the last 30 years or so. The difficulty in estimating the height, period and direction for the sea and swell waves make wave observations the least often recorded element in marine observations. The estimate of wave heights is very subjective and depends upon the experience of the observer and the size of the

platform. Wave heights reported by most transient ships tend to be low by about 15% when compared to reference measurements. The data in this publication have not been adjusted for this suspected biases. Period estimates also tend to be low.

### Surface Currents

The ocean currents charts are compiled principally from ship drift reports that were forwarded by the various merchant marines to the Naval Oceanographic Office. From these drift observations the set (direction) and drift (speed) of the prevailing currents are calculated for each one-degree square. The density of observations is greatest along the major shipping lanes and reliability of the current charts is best in these areas. The data are considered most useful when used collectively as in summaries where a large number of observations is available.

The surface currents summarized here are based on some 3,900 observations for 46 one-degree squares. The charts displayed are Annual - January through December, Winter - November through April, and Summer - May through October. A legend precedes the three charts. These charts may not be truly representative of the actual flow in the Persian Gulf where currents are strongly tidal. Other sources describing predictable hourly changes of tidal currents should be consulted.

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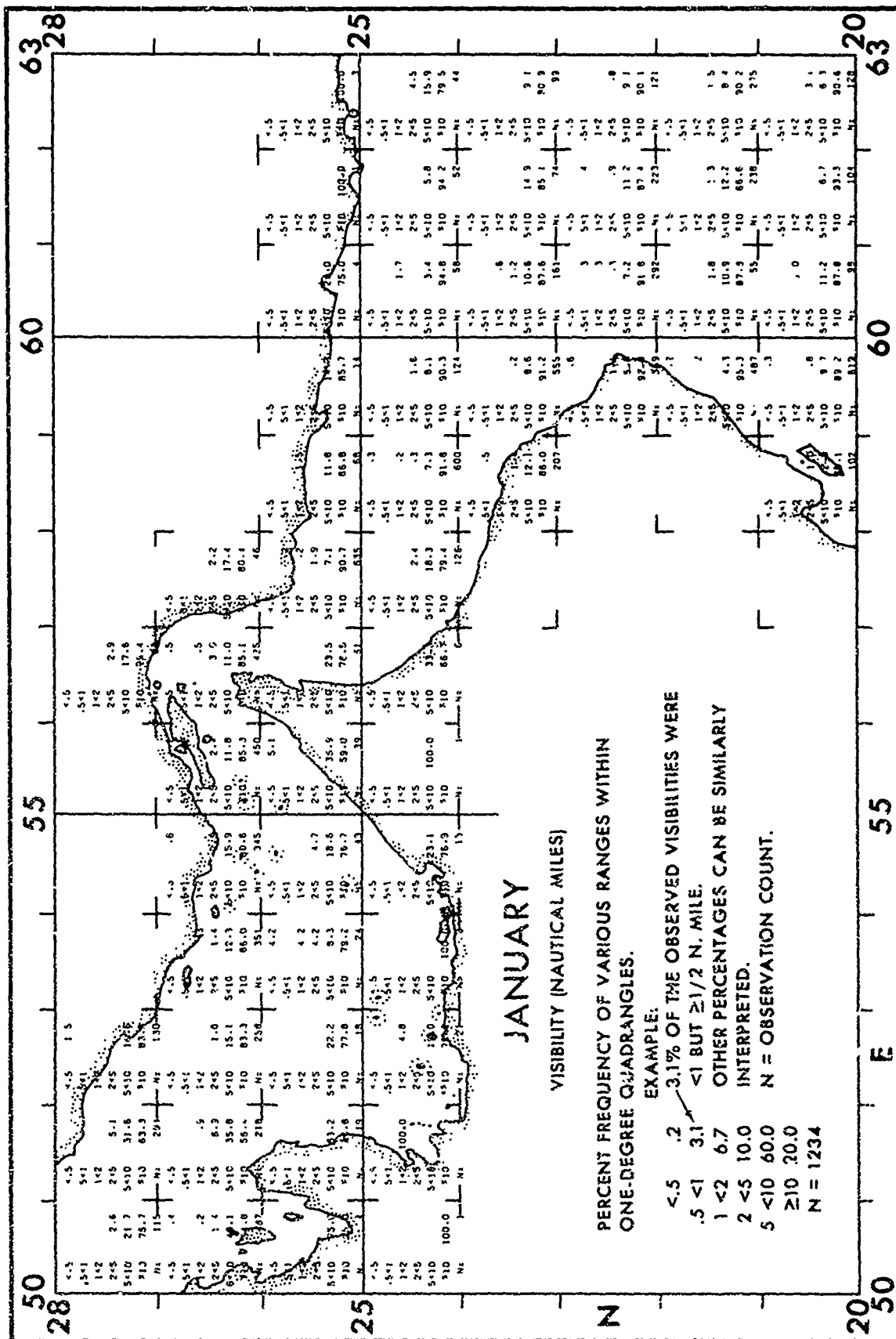
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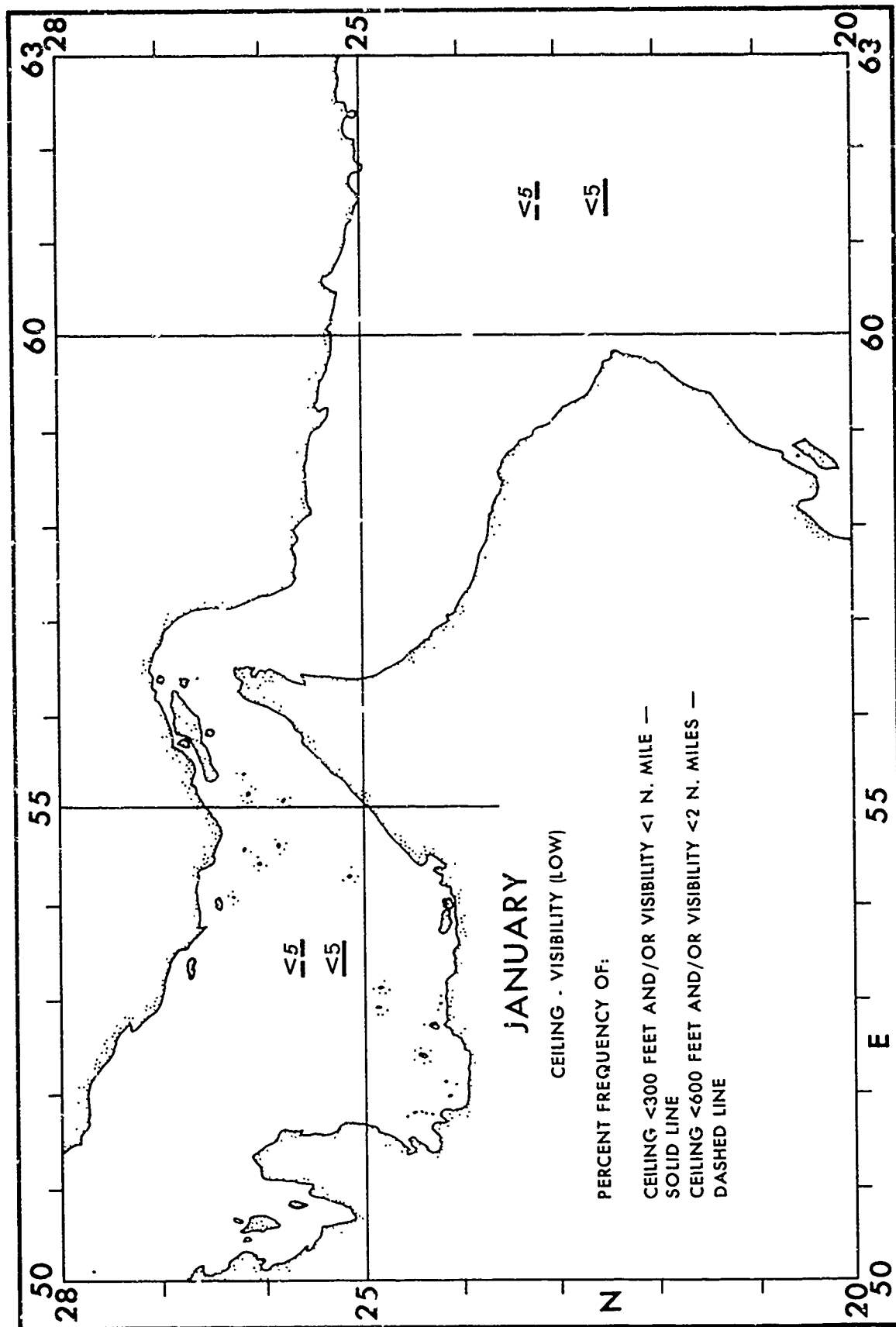
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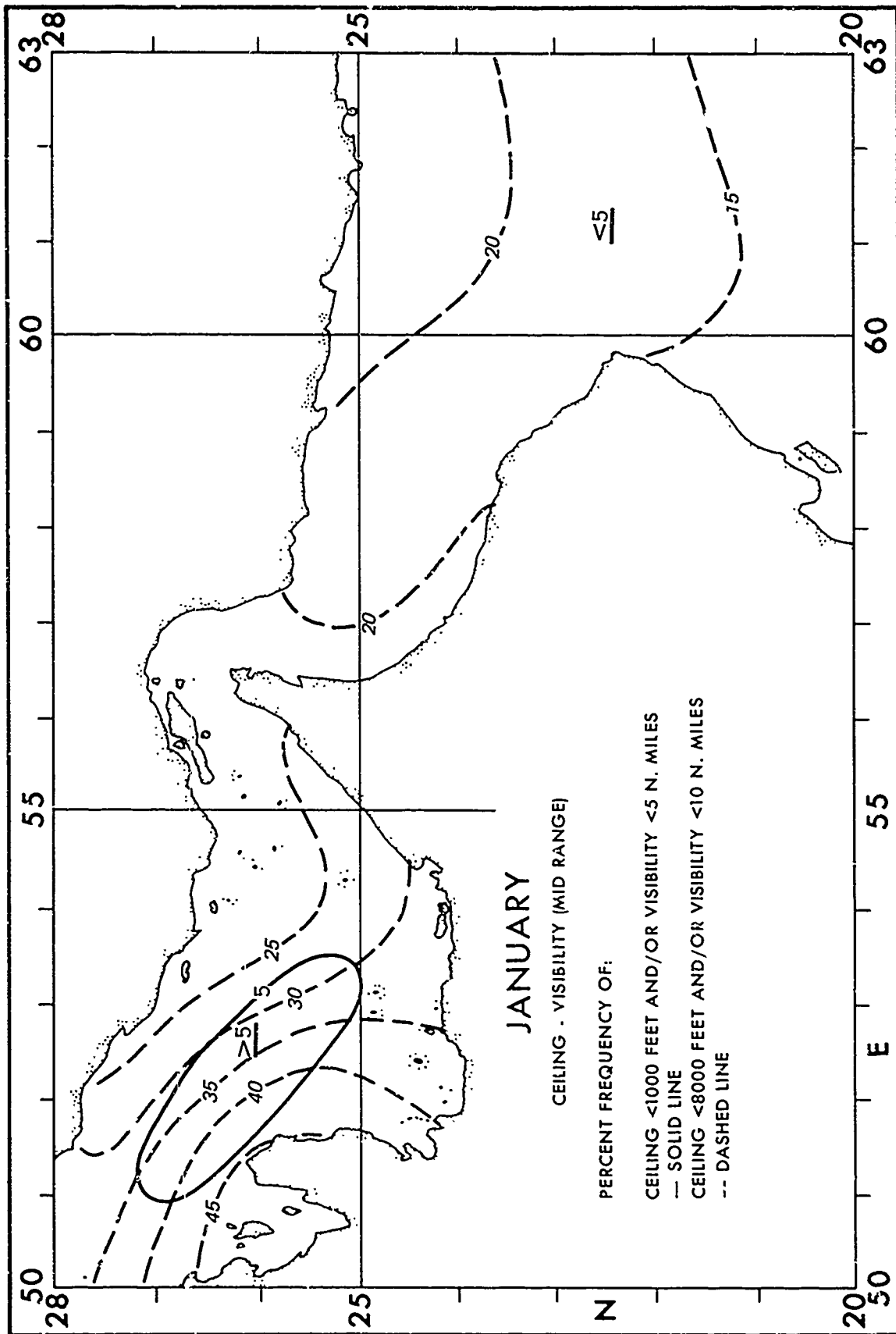
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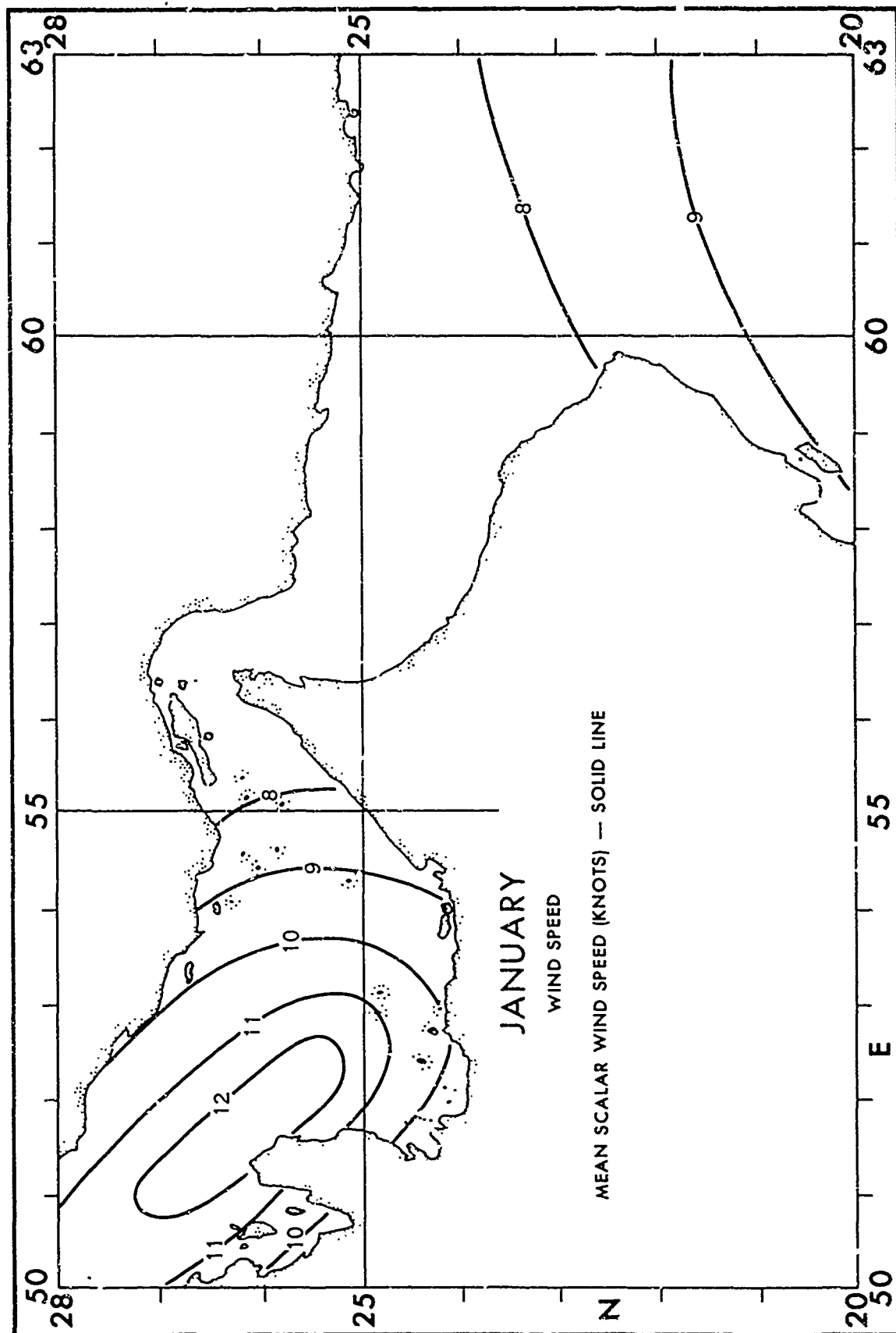
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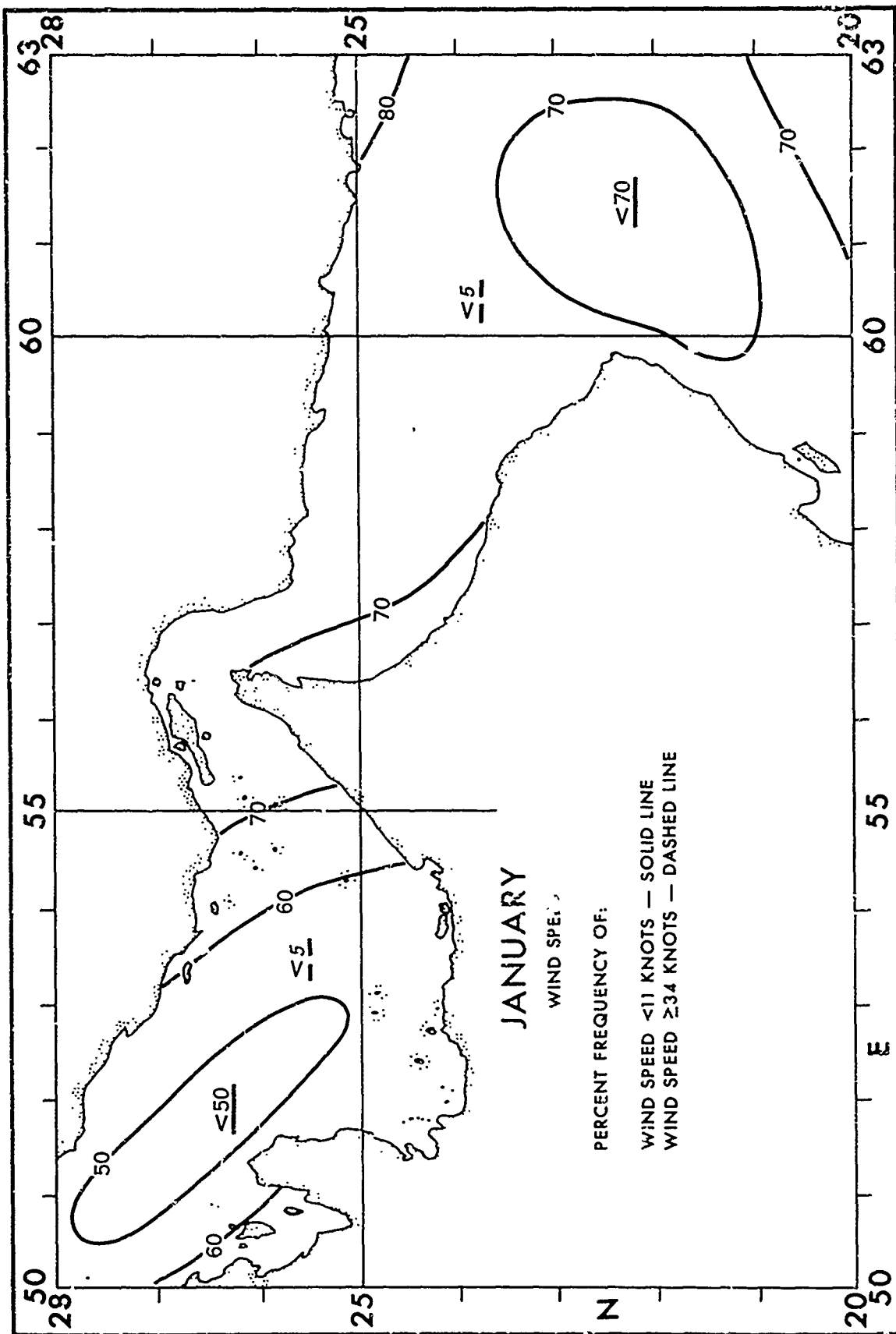
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	VISIBILITY-TABLES	CEILING-VISIBILITY (low)	SCALAR MEAN WIND SPEED	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots	WIND SPEED <11 and 22-33 knots			
JANUARY	2	3	4	5	6	7	8	9	10	11				
FEBRUARY	12	13	14	15	16	17	18	19	20	21				
MARCH	22	23	24	25	26	27	28	29	30	31				
APRIL	32	33	34	35	36	37	38	39	40	41				
MAY	42	43	44	45	46	47	48	49	50	51				
JUNE	52	53	54	55	56	57	58	59	60	61				
JULY	62	63	64	65	66	67	68	69	70	71				
AUGUST	72	73	74	75	76	77	78	79	80	81				
SEPTEMBER	82	83	84	85	86	87	88	89	90	91				
OCTOBER	92	93	94	95	96	97	98	99	100	101				
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DECEMBER	112	113	114	115	116	117	118	119	120	121				

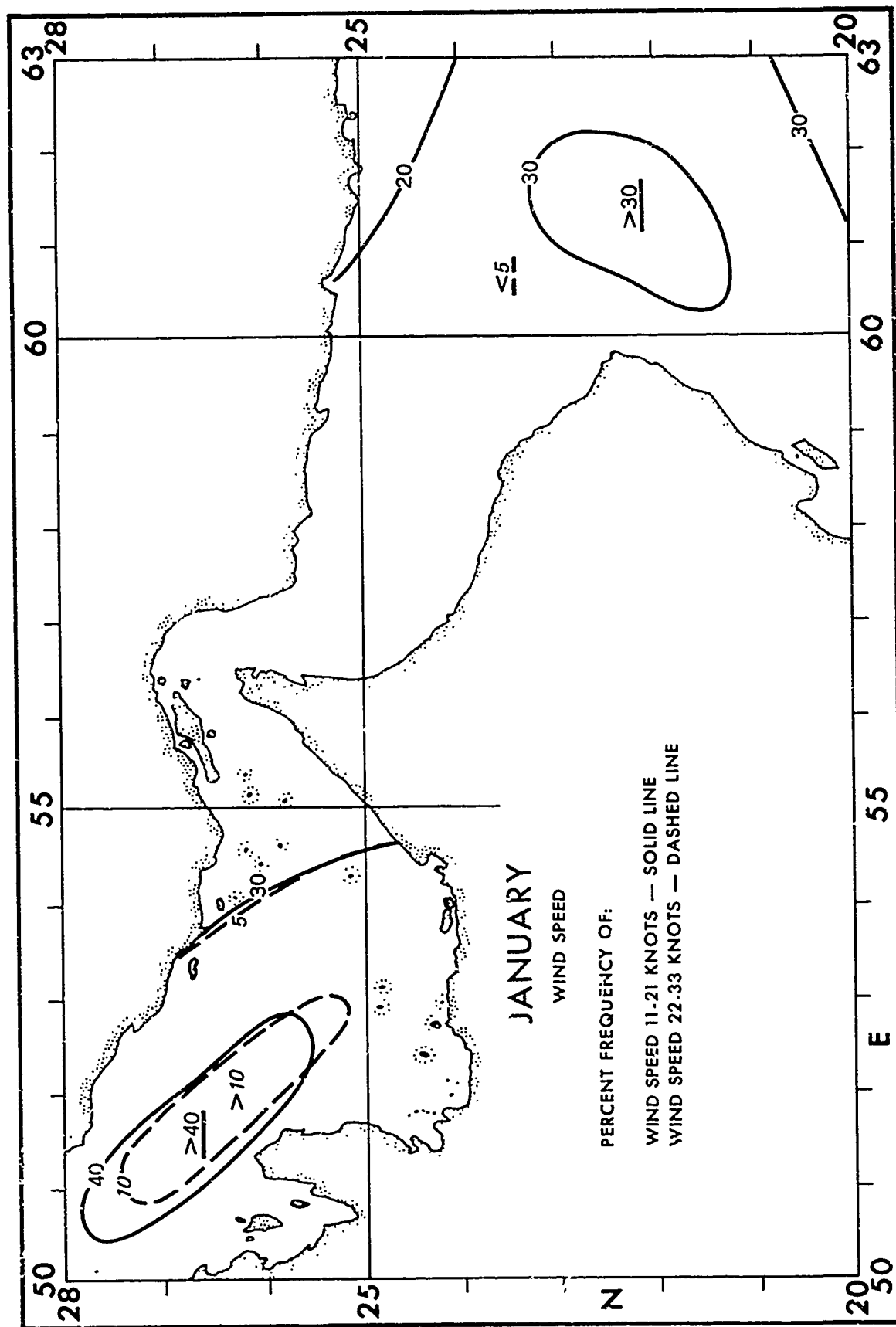


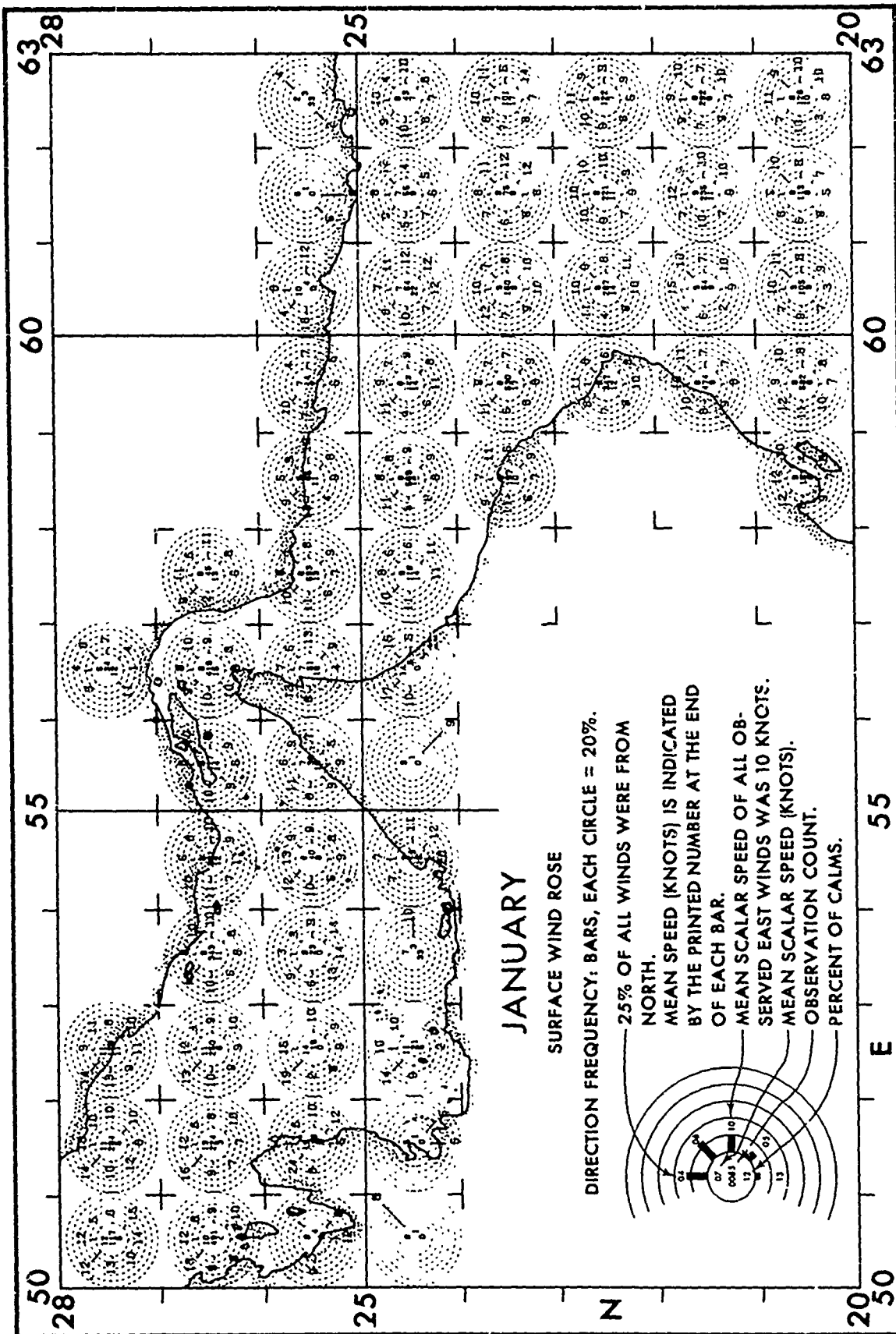


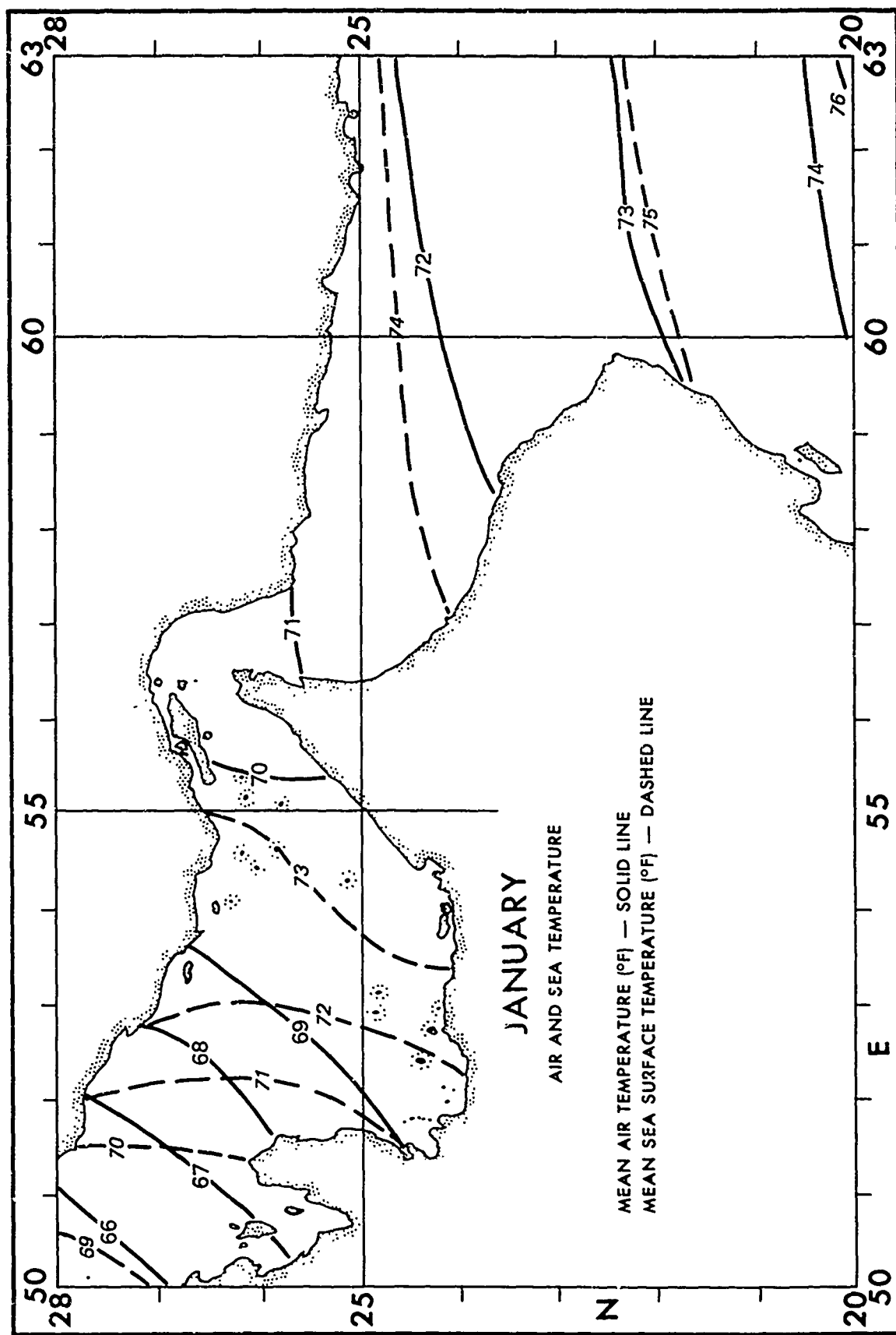


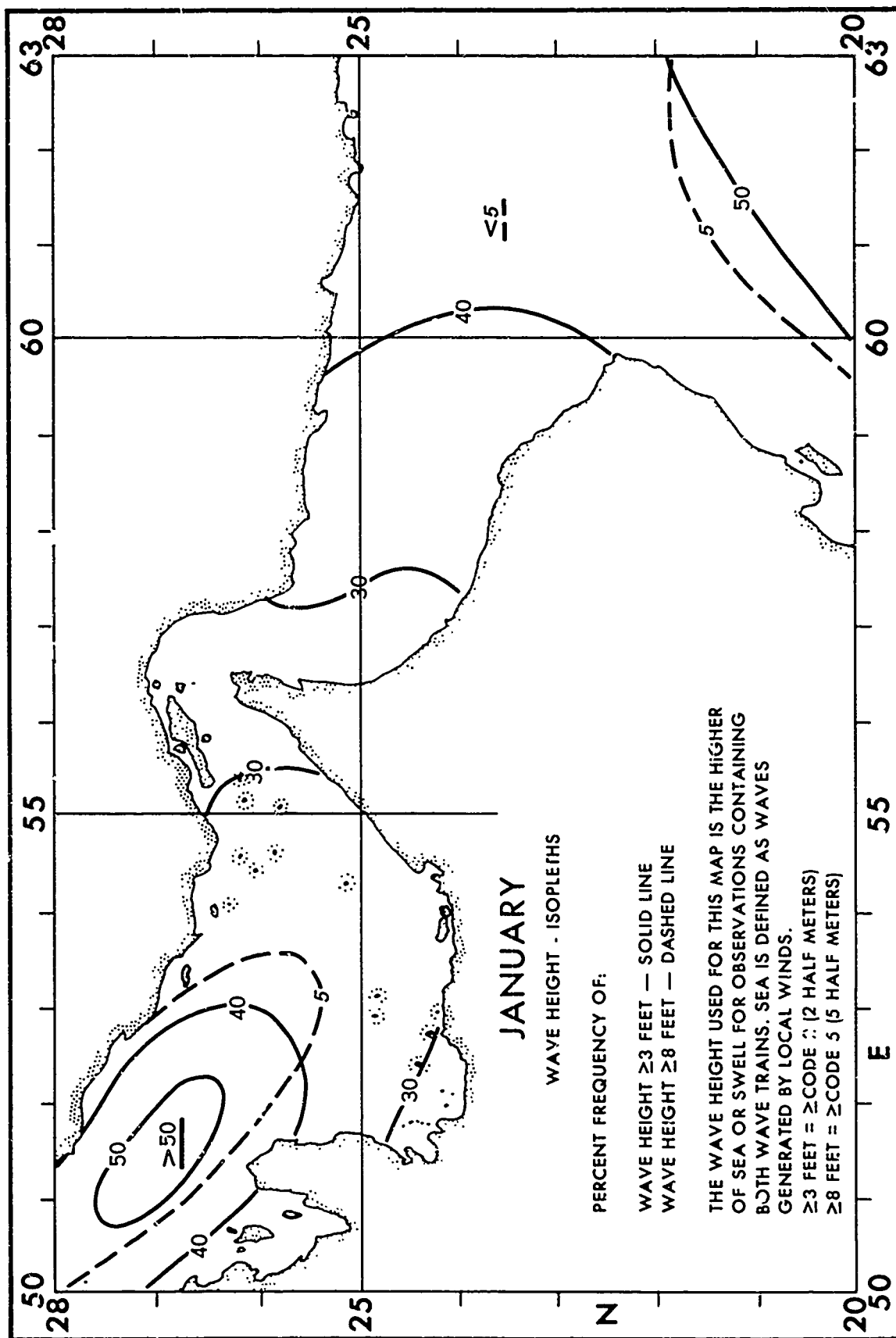


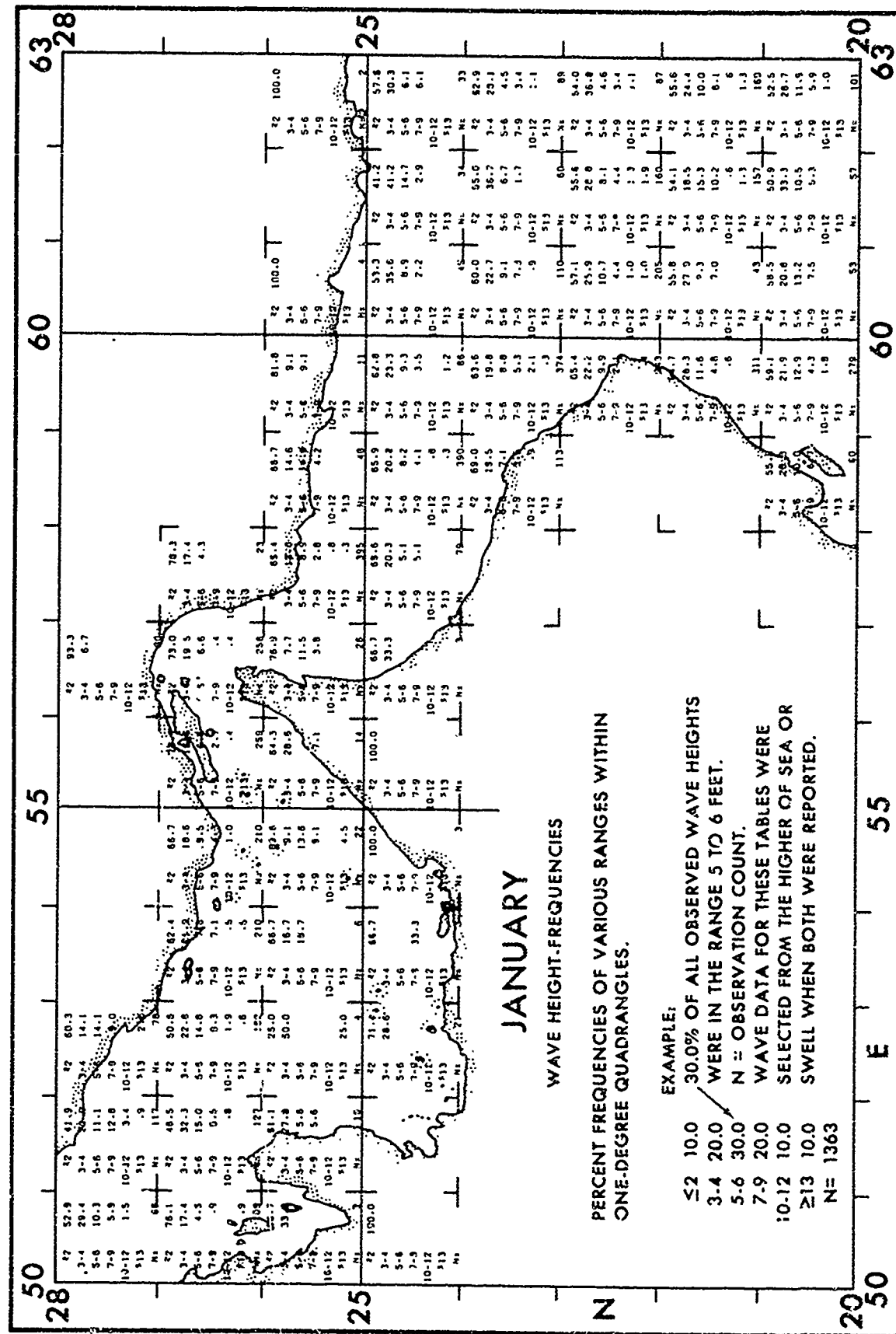


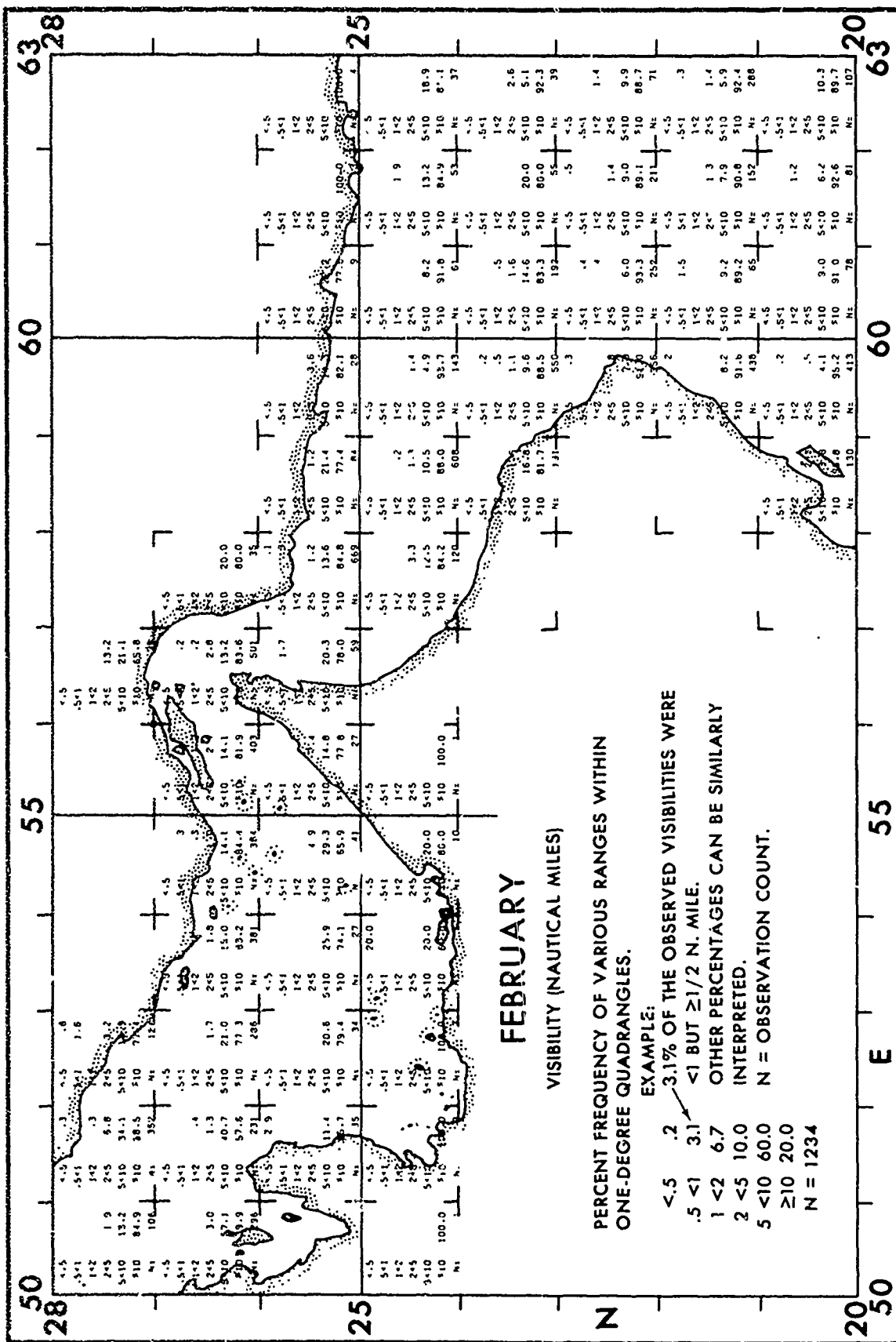


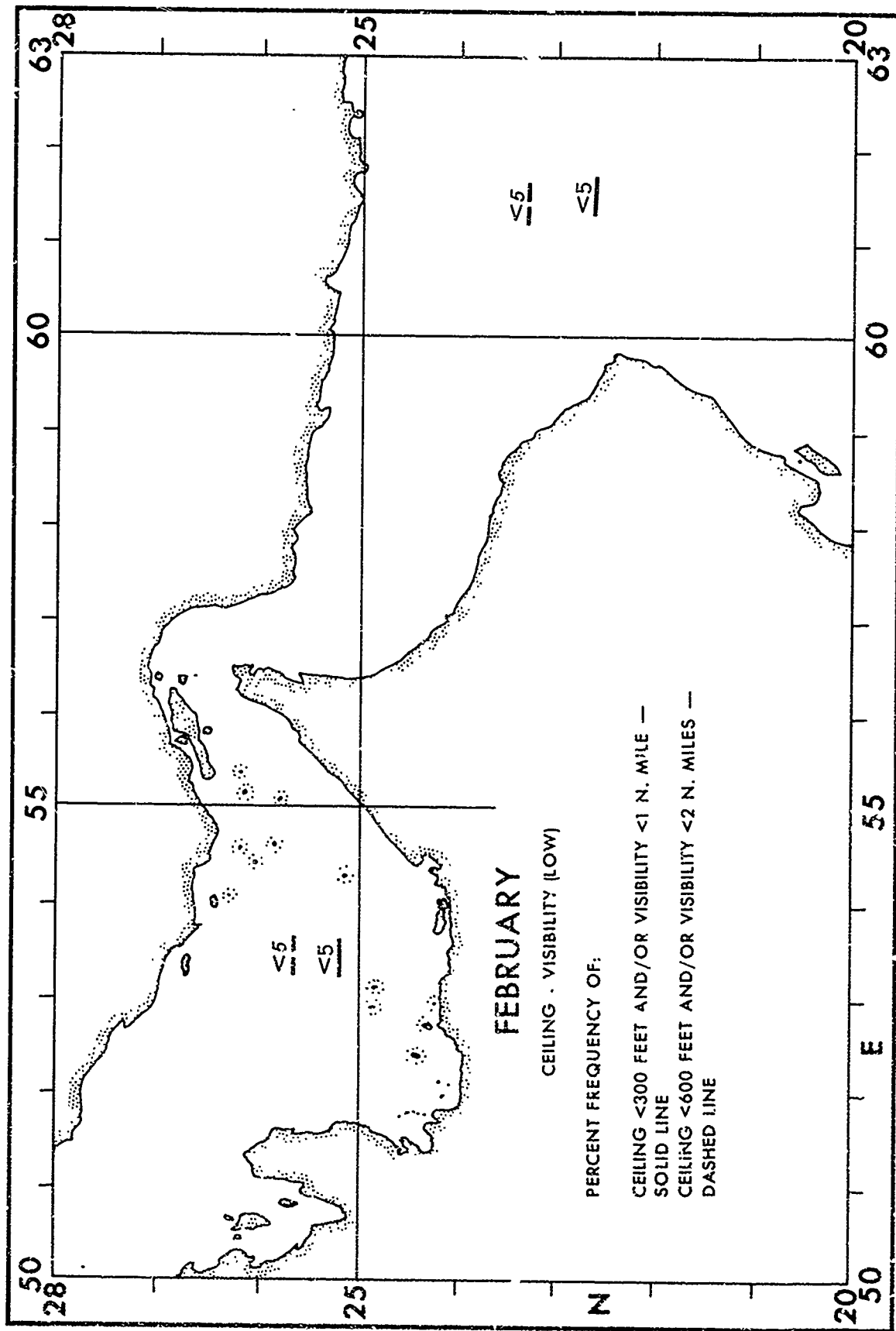


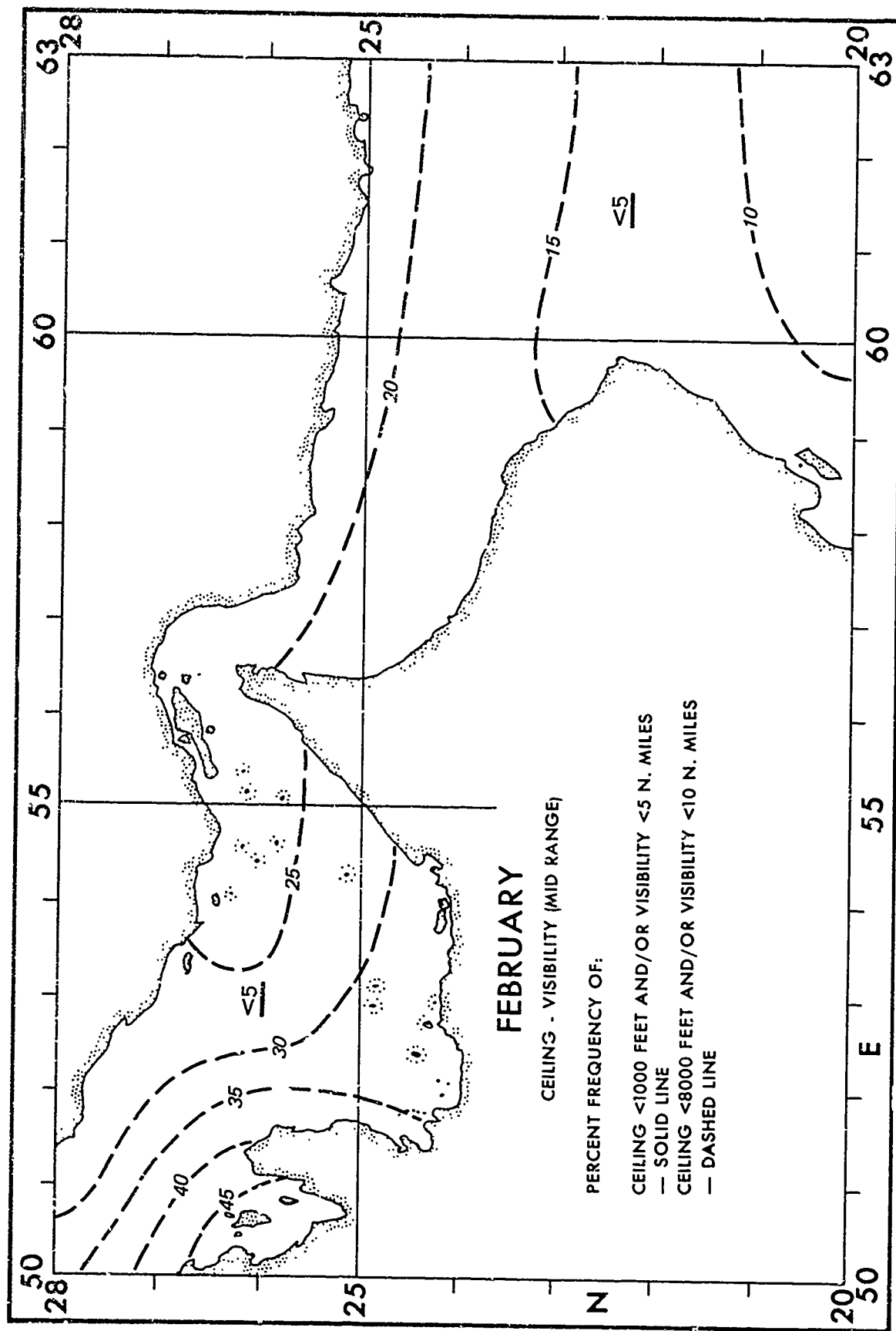


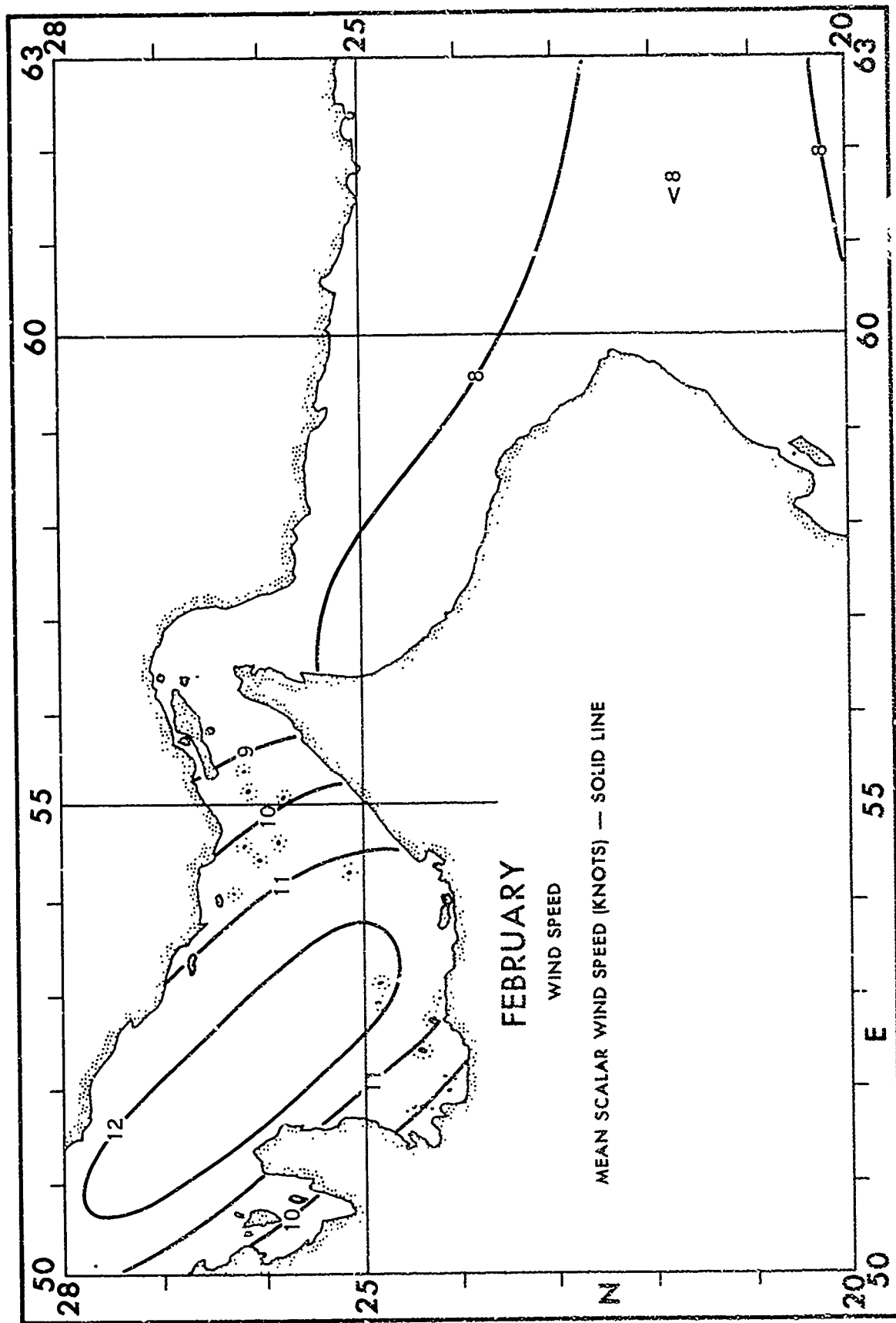


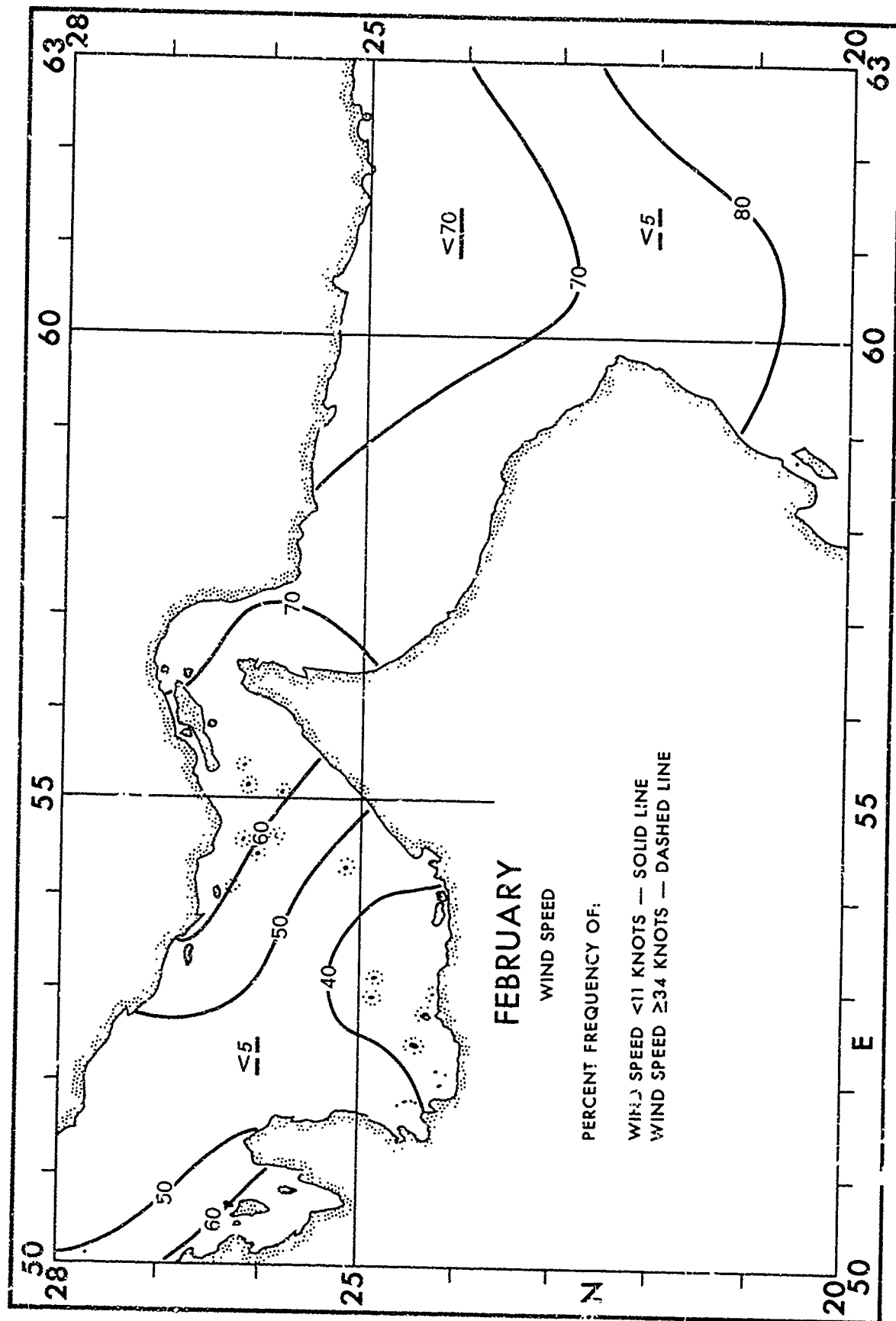


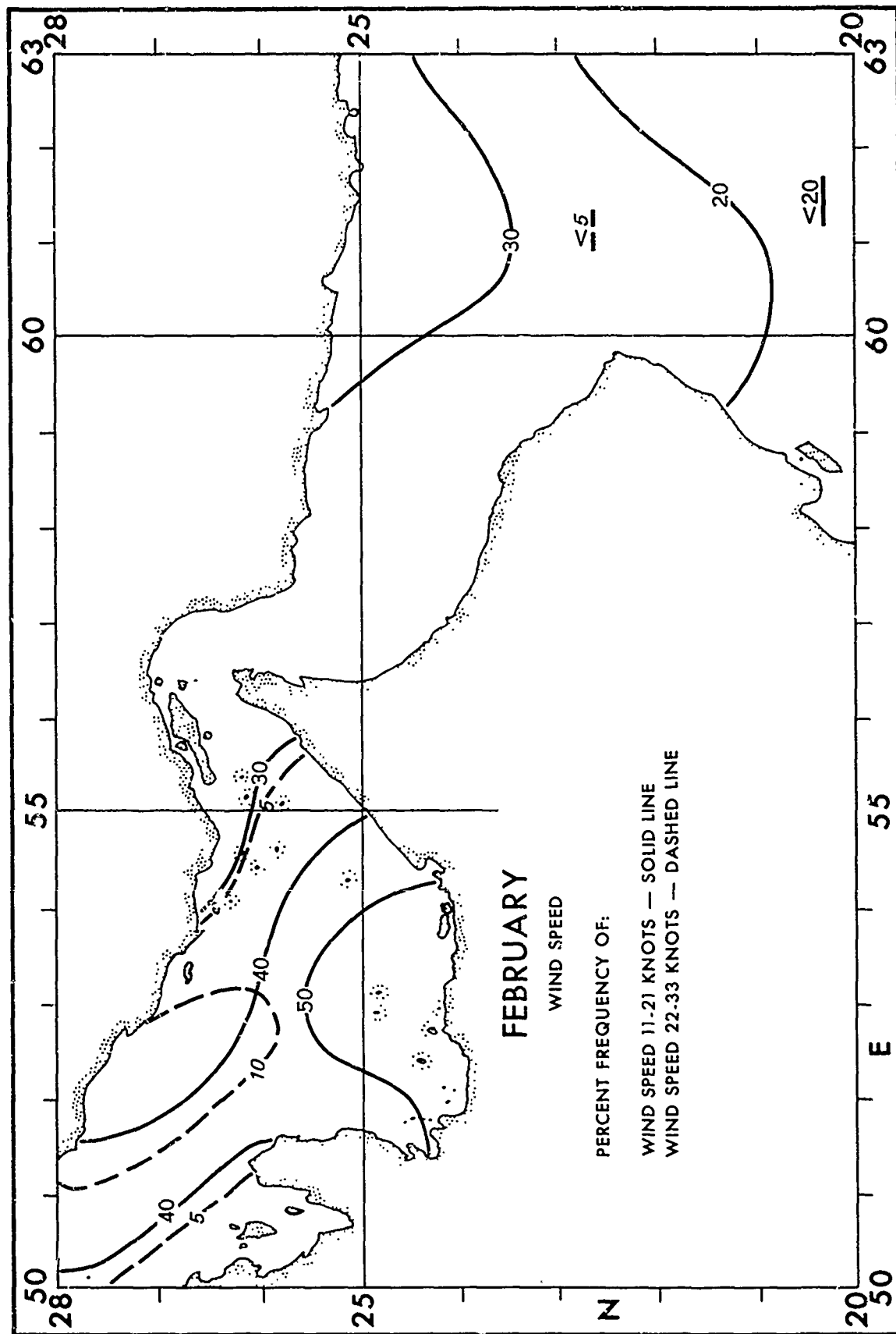


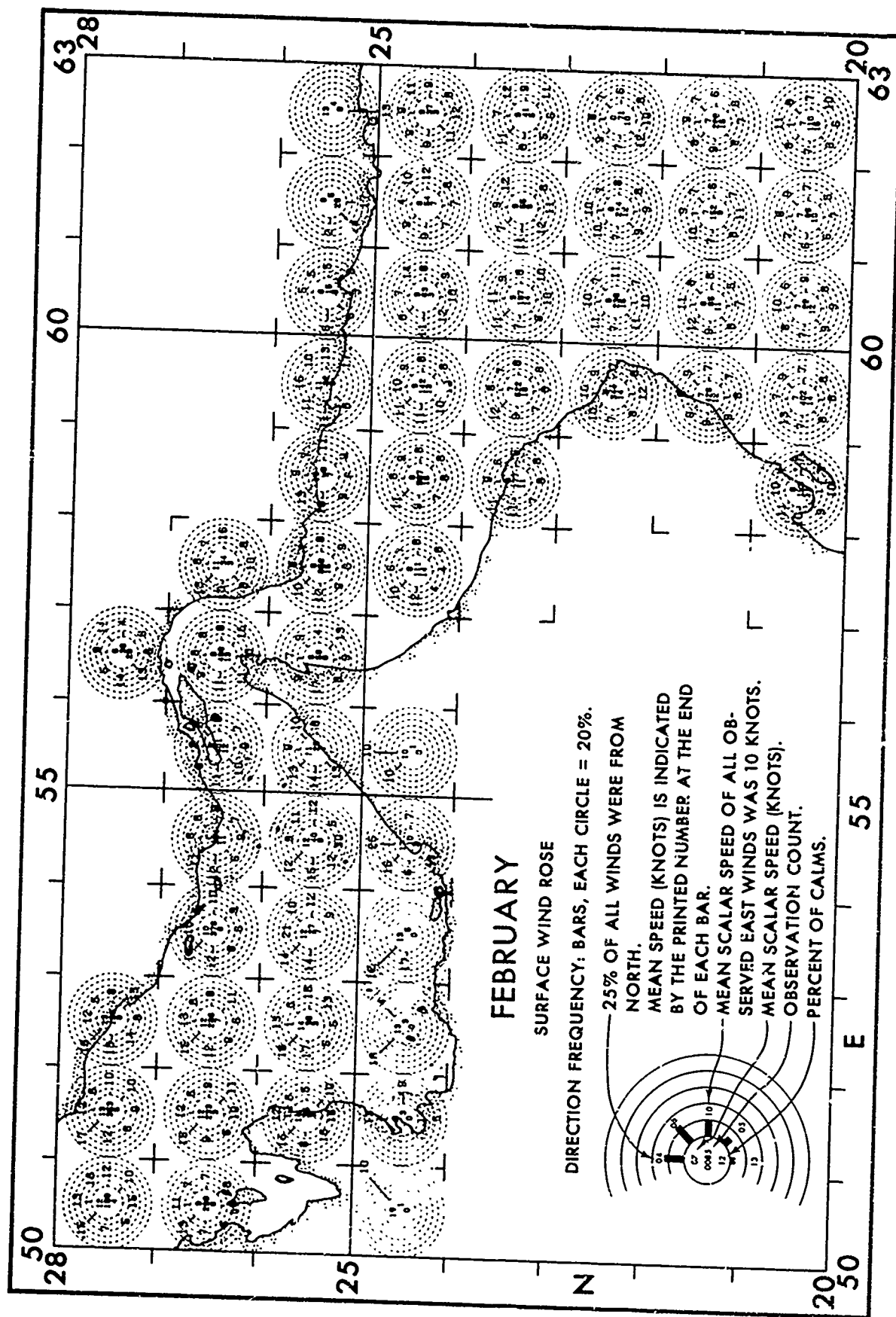


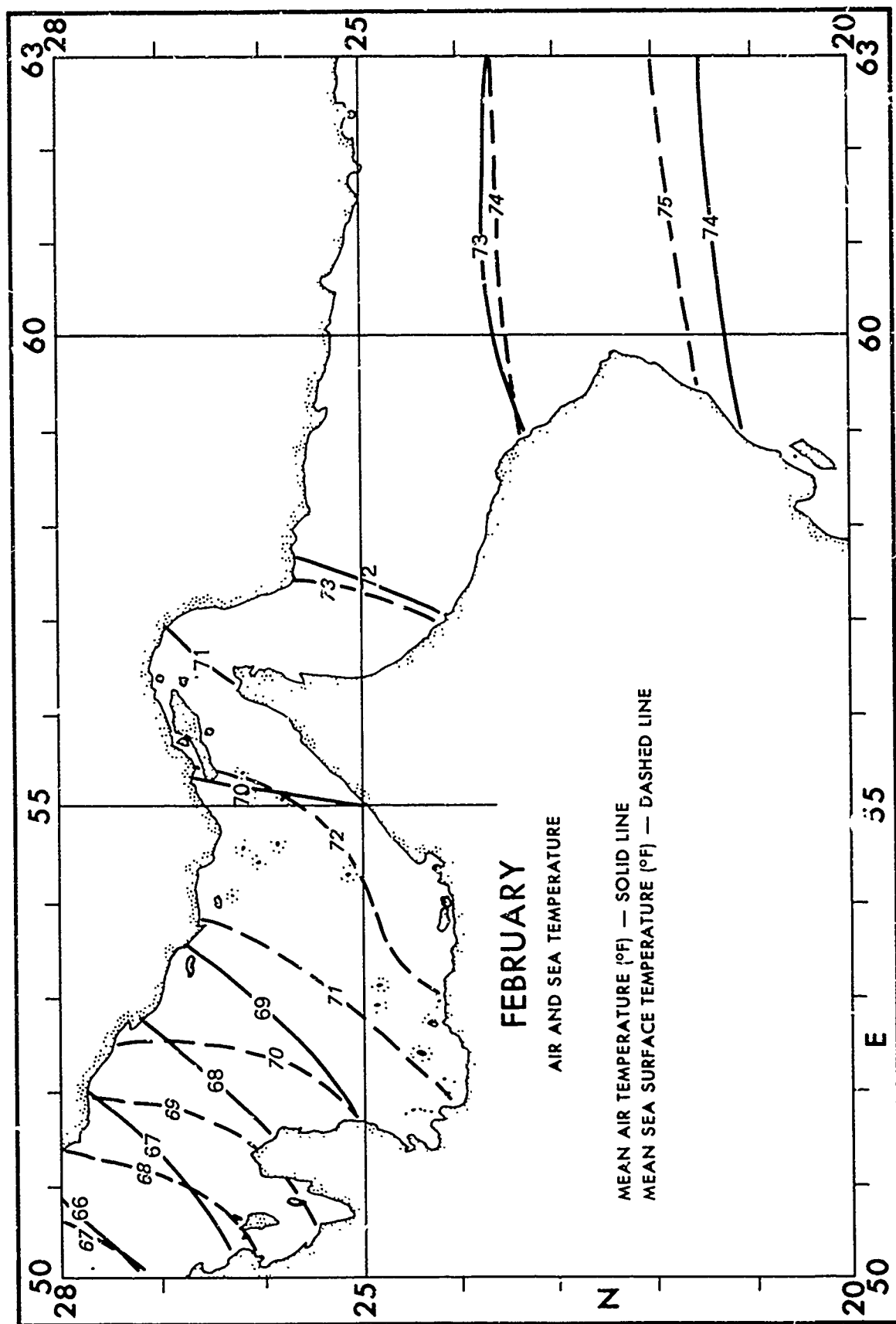


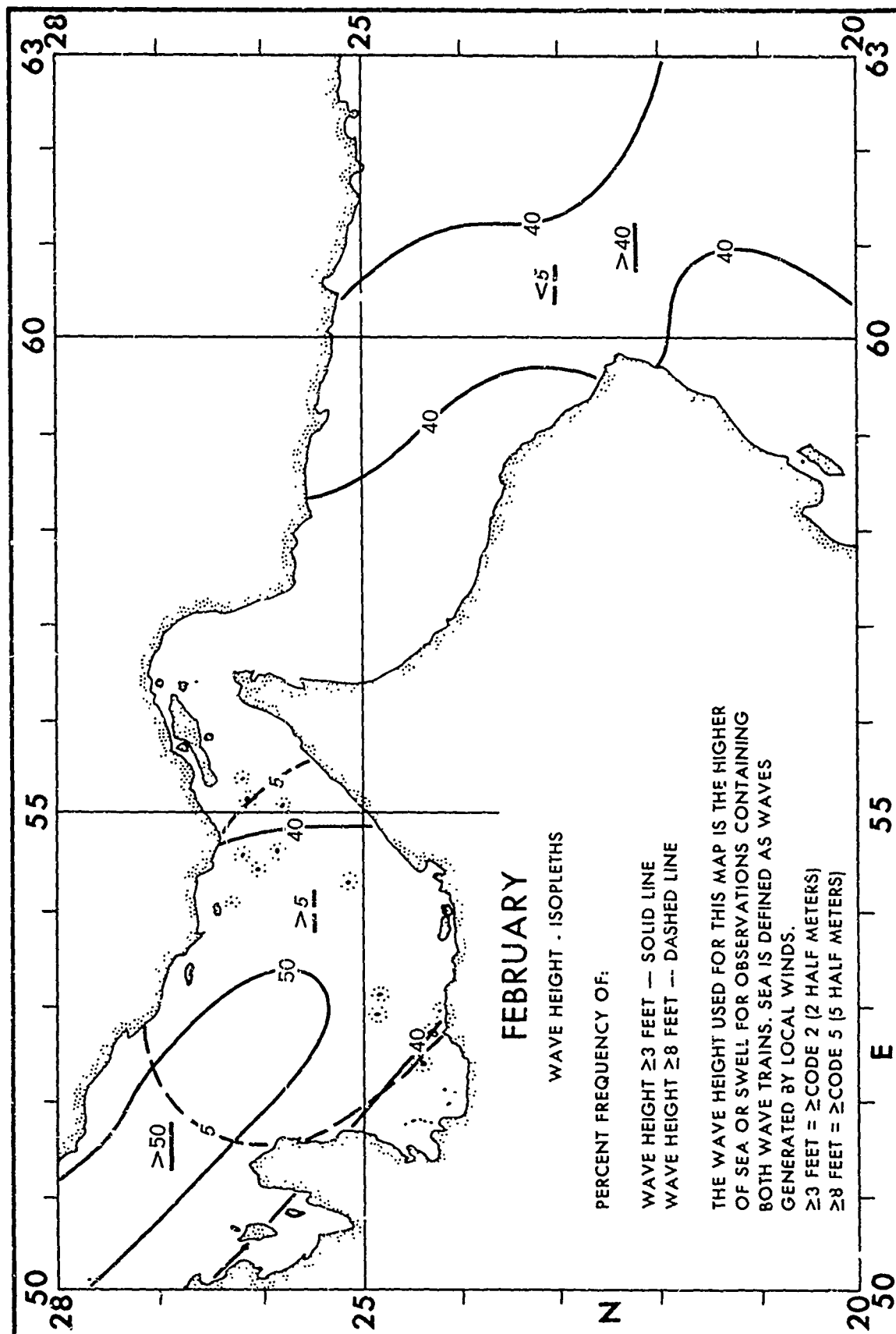


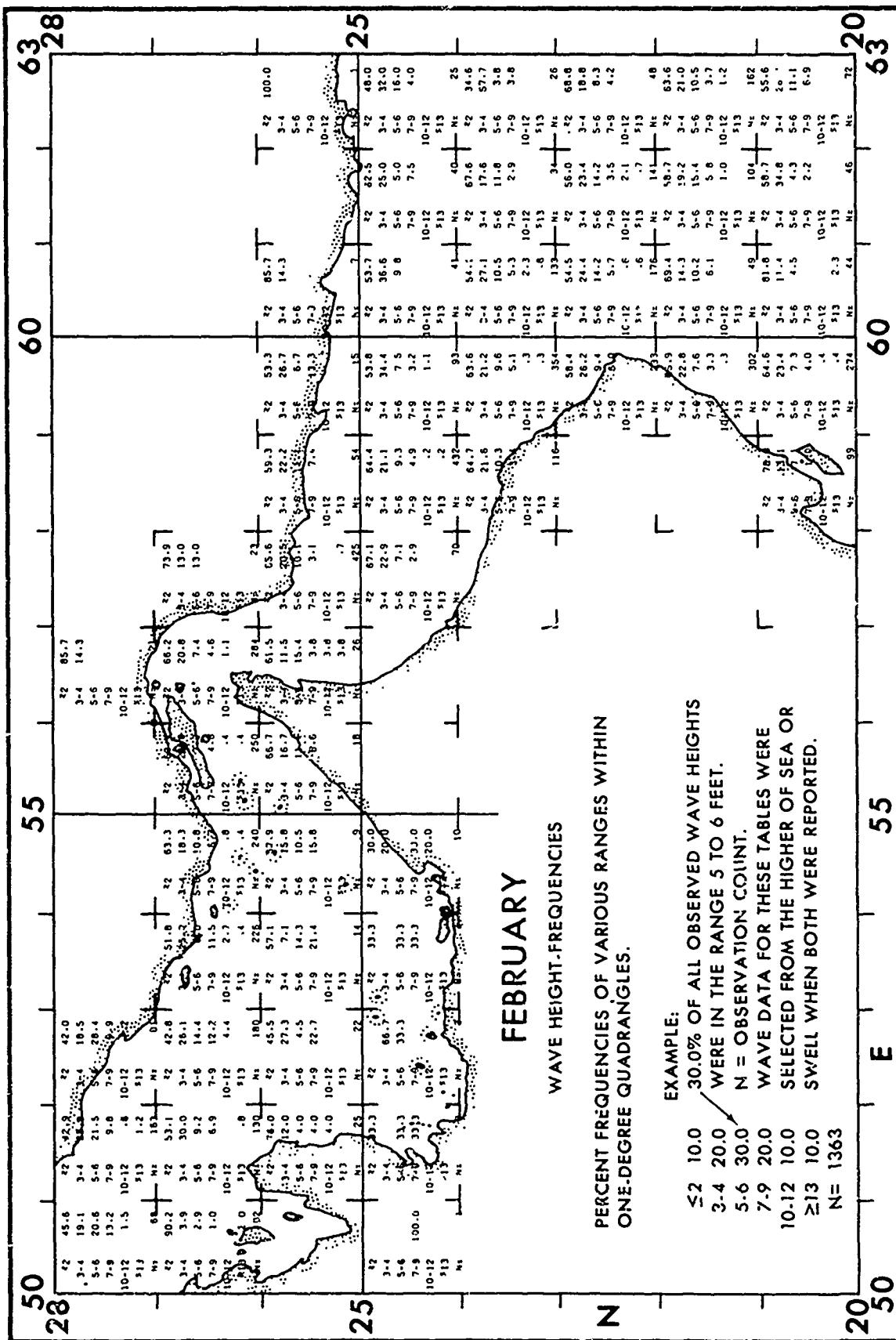


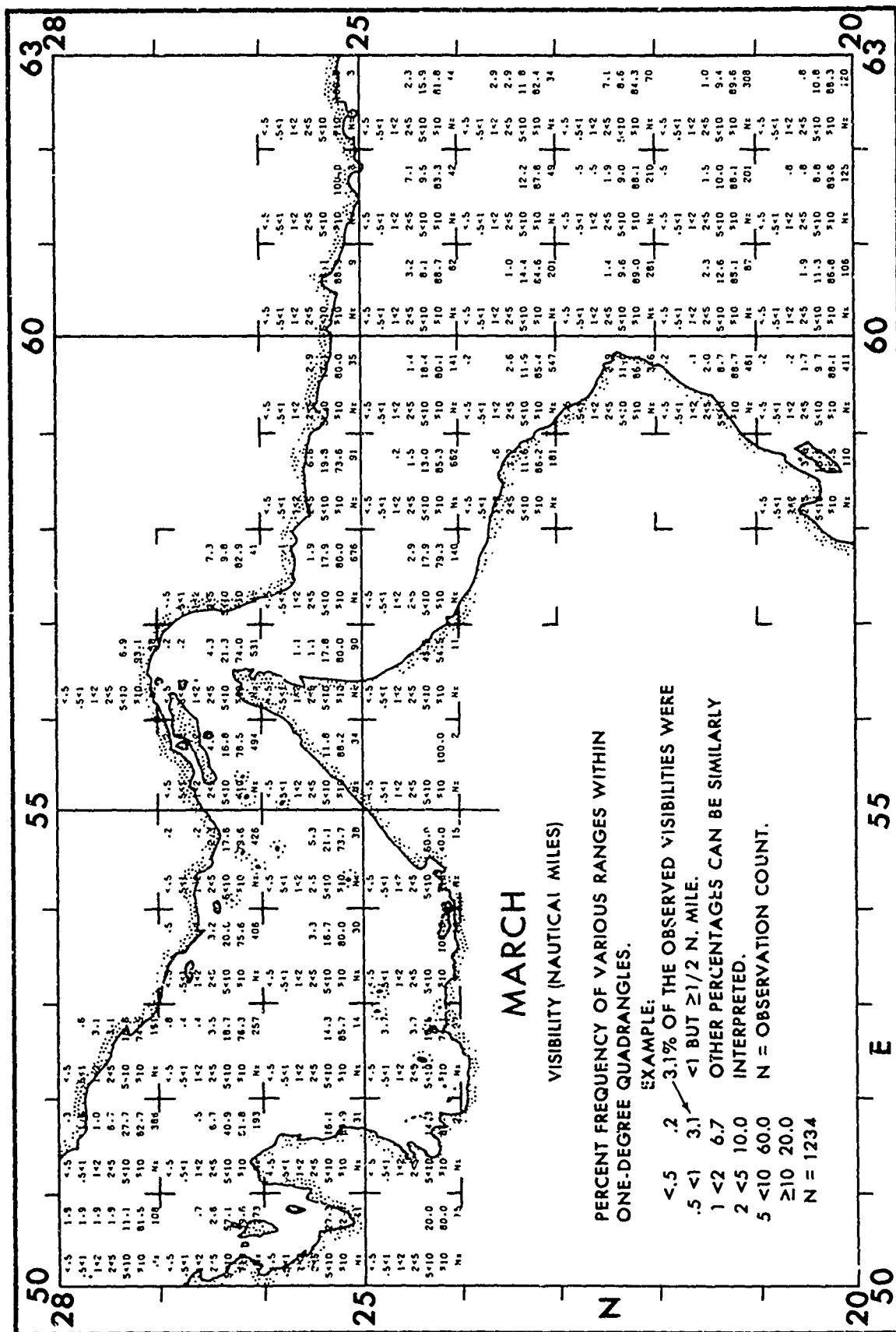


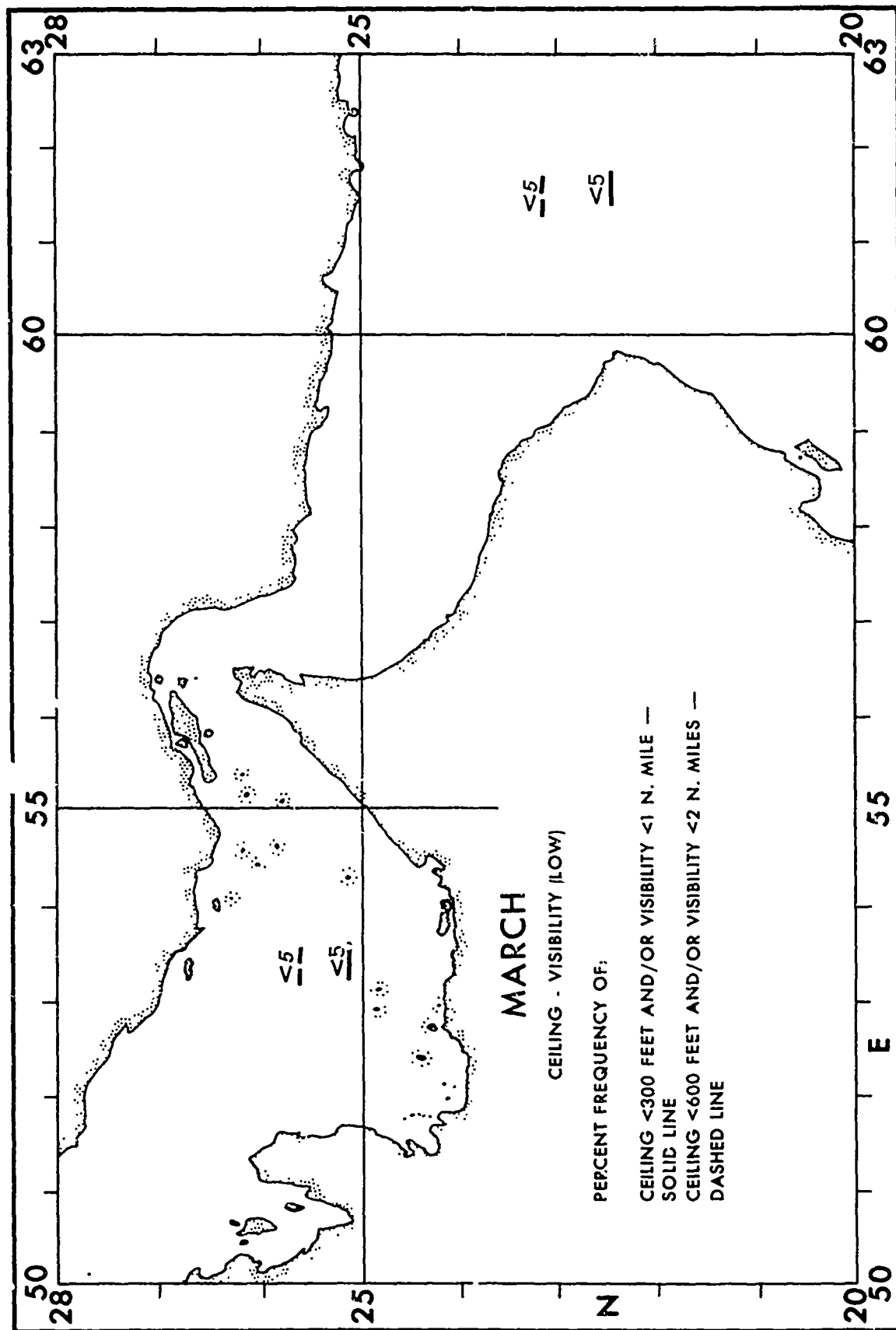


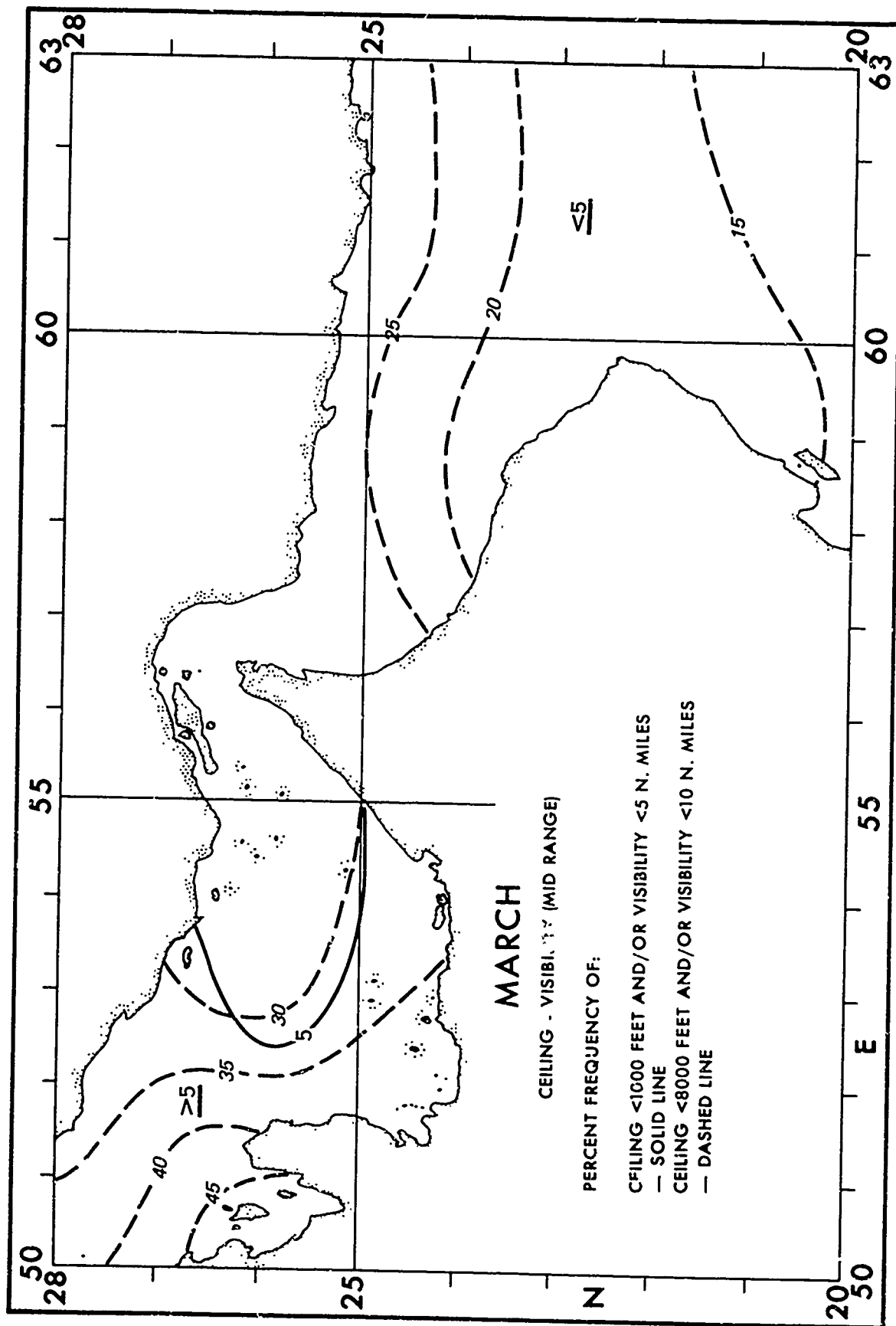


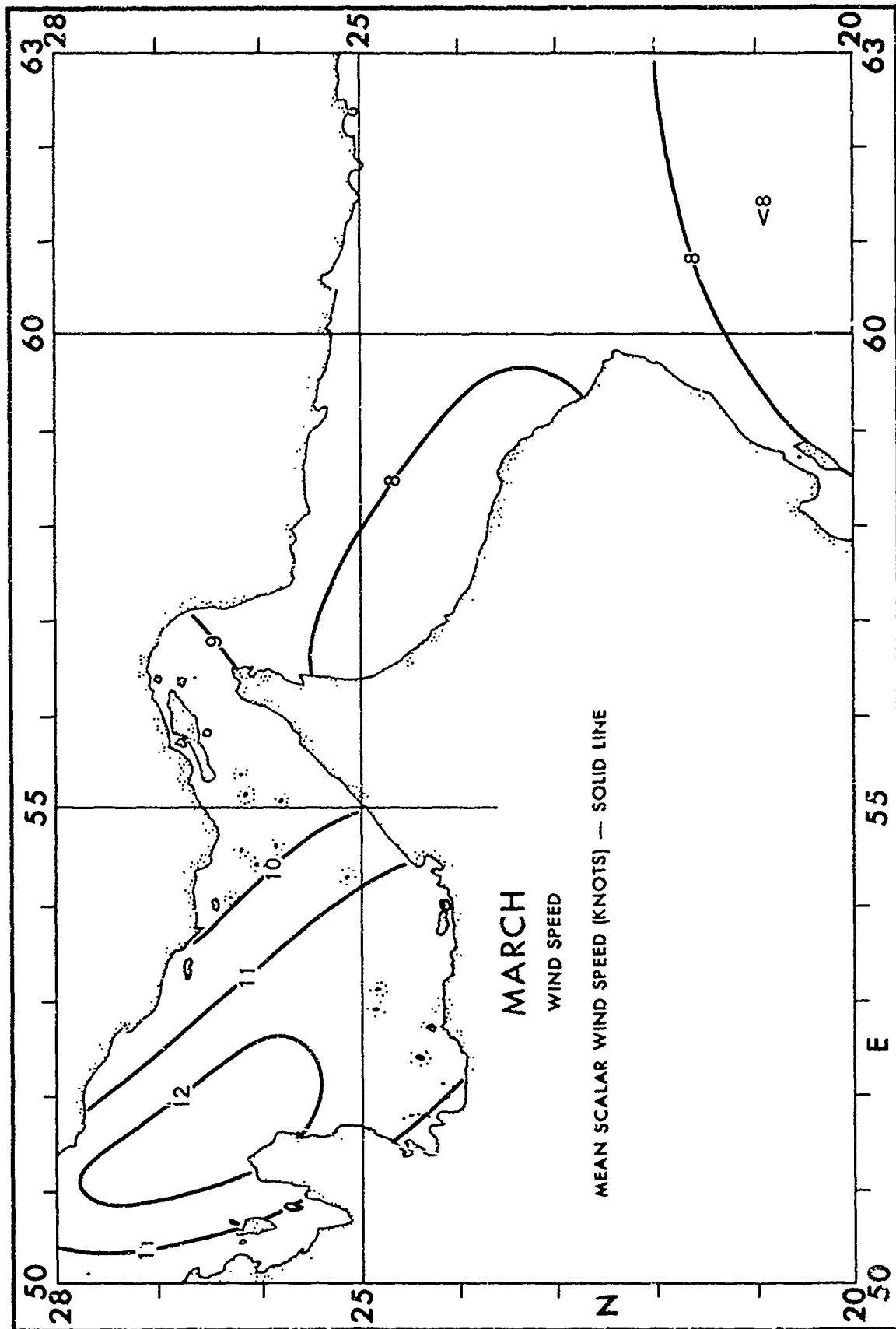


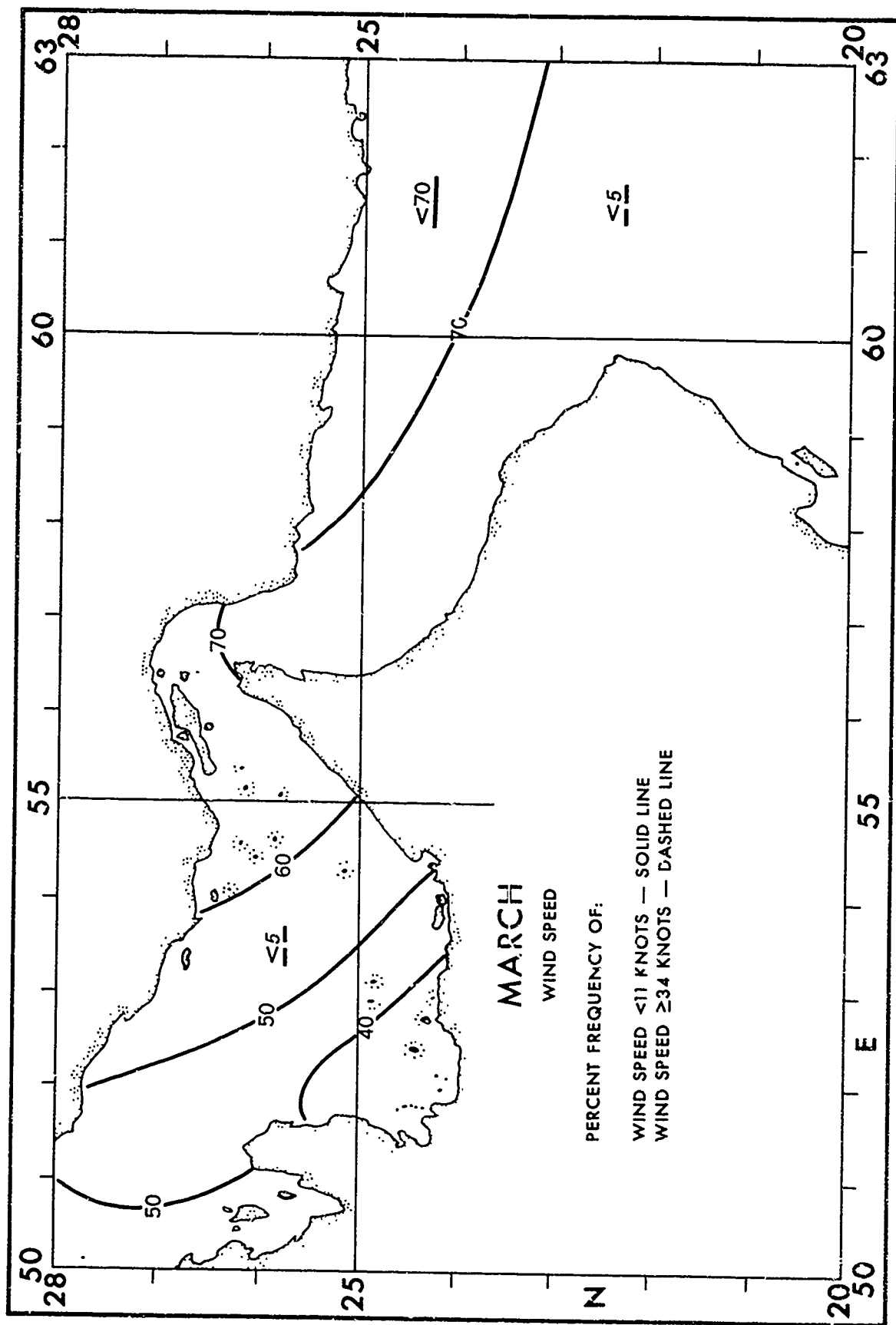


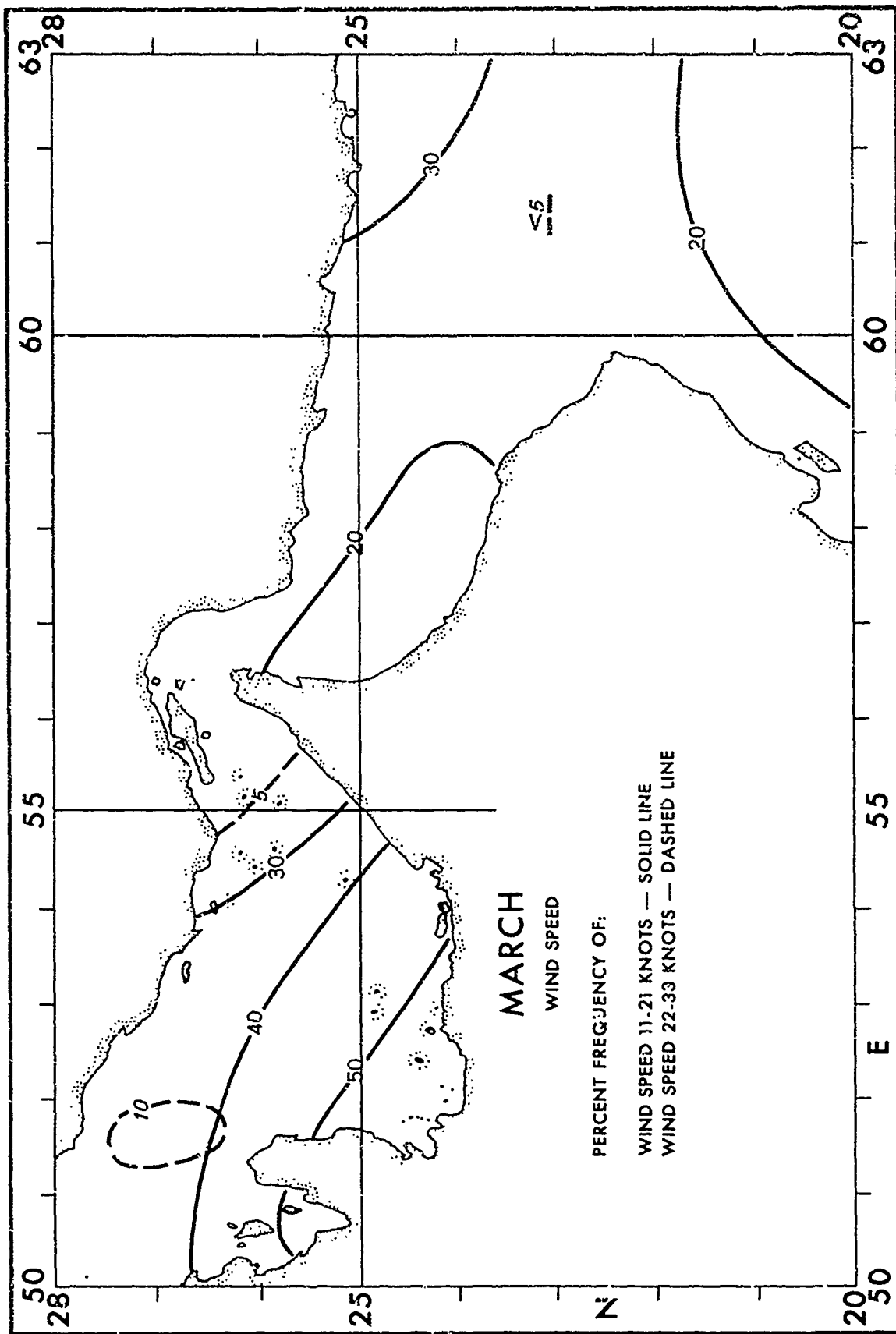




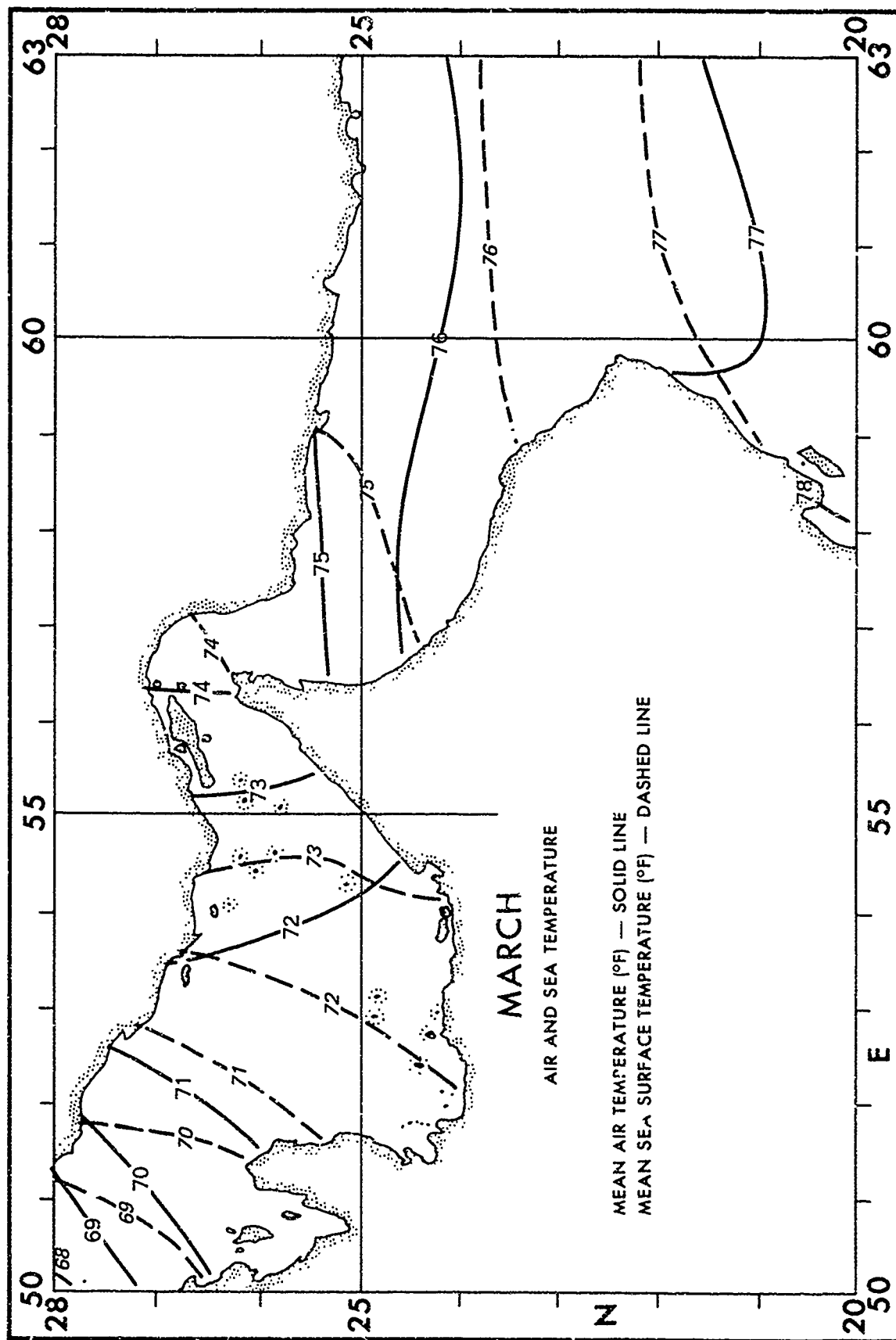


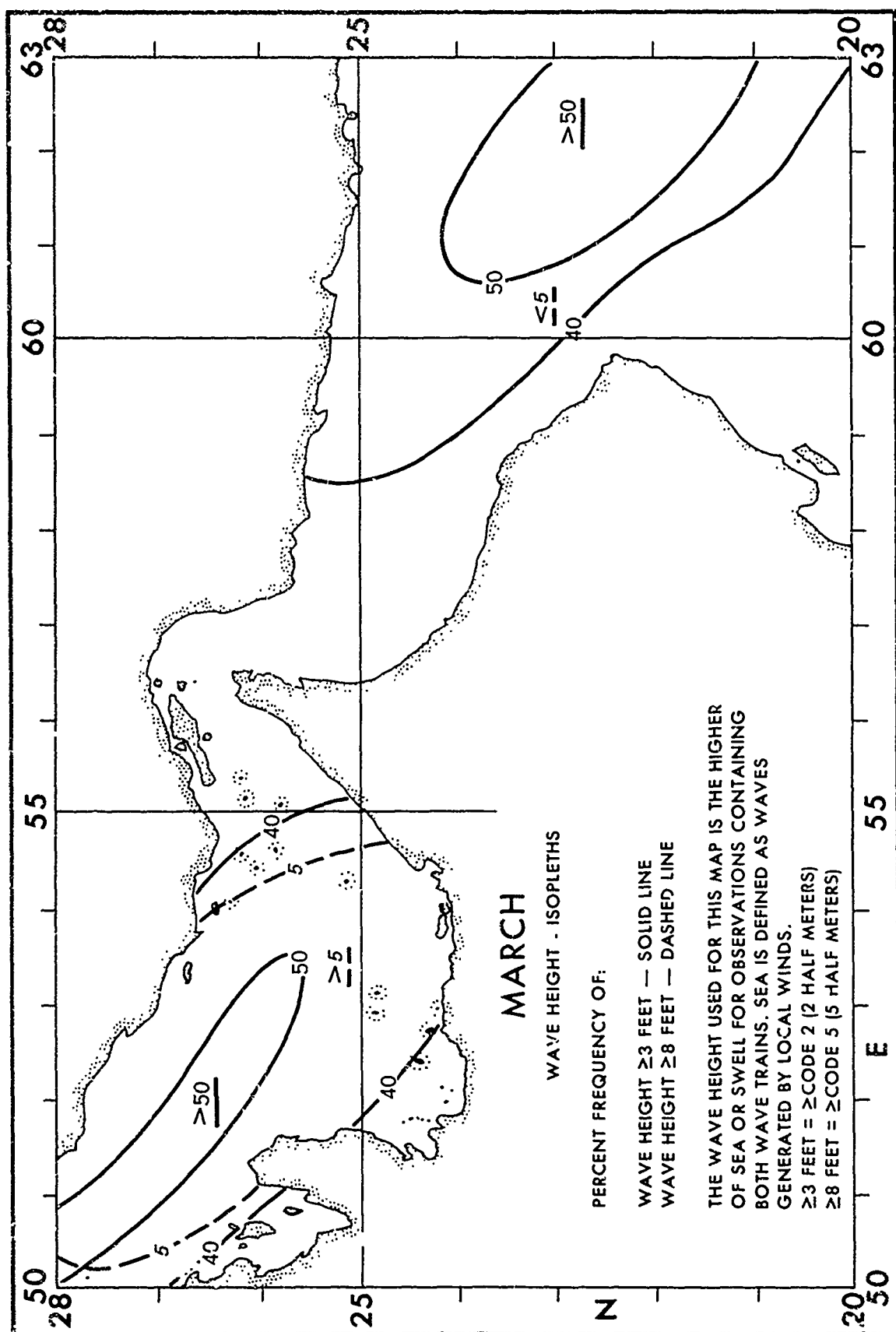


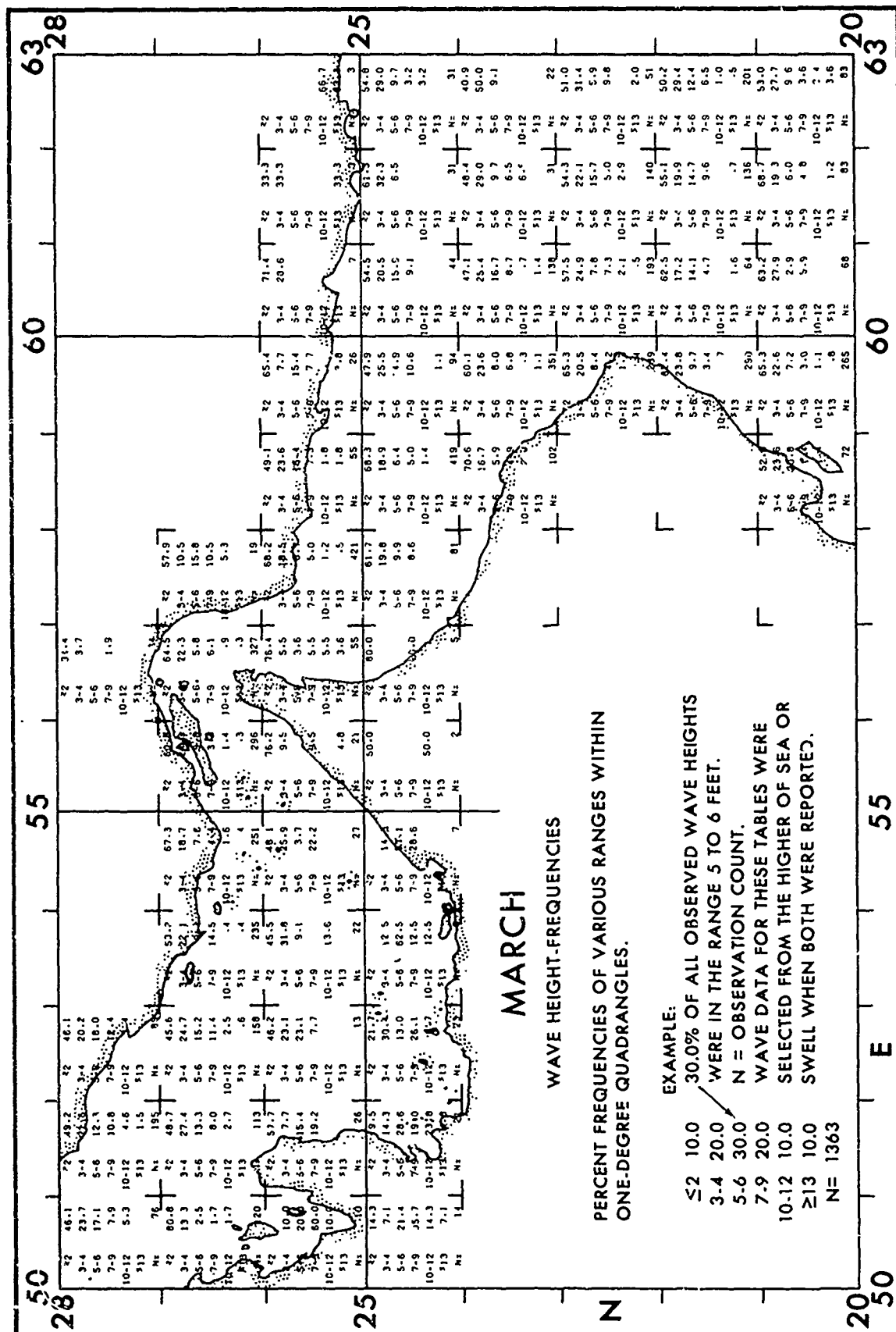












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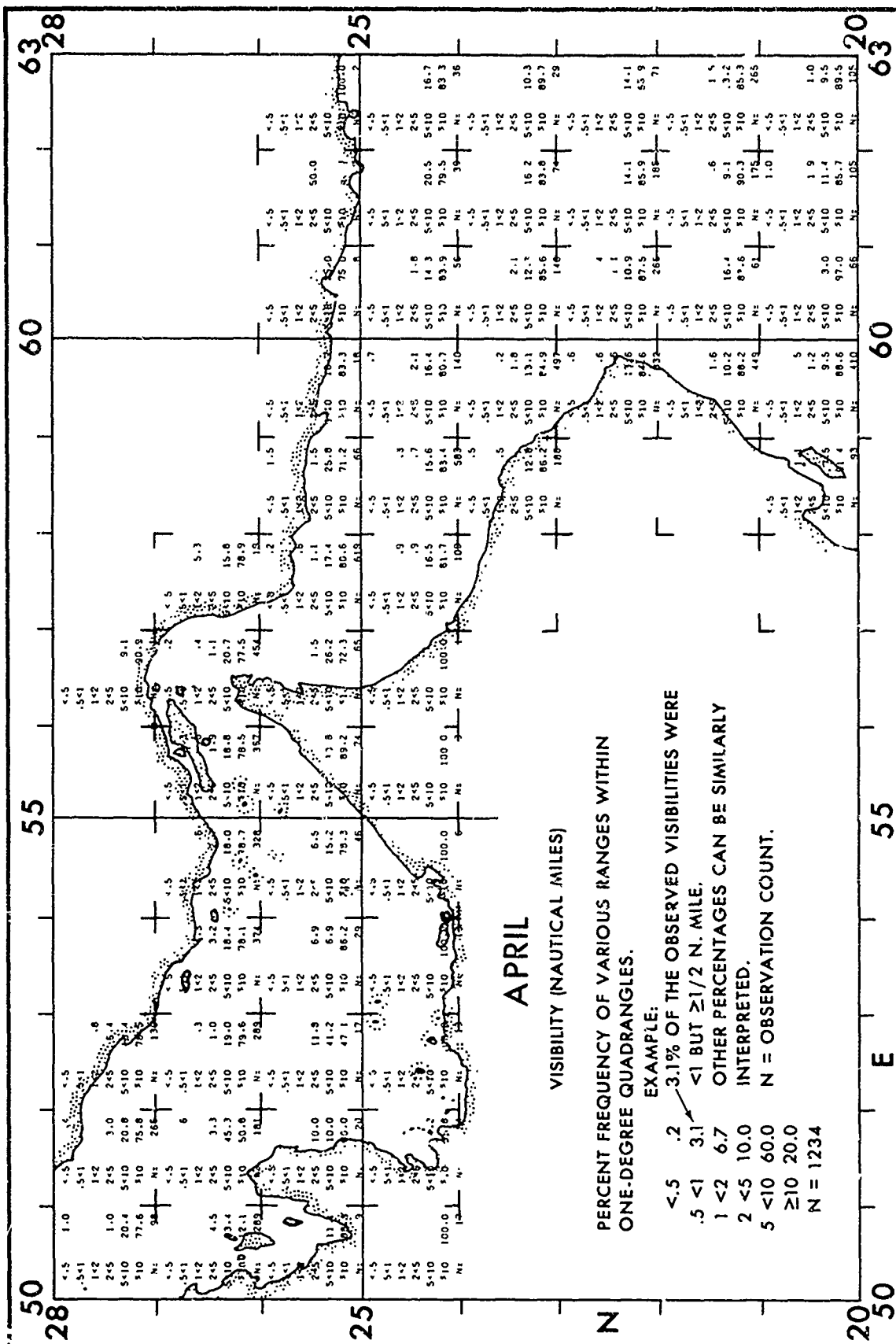
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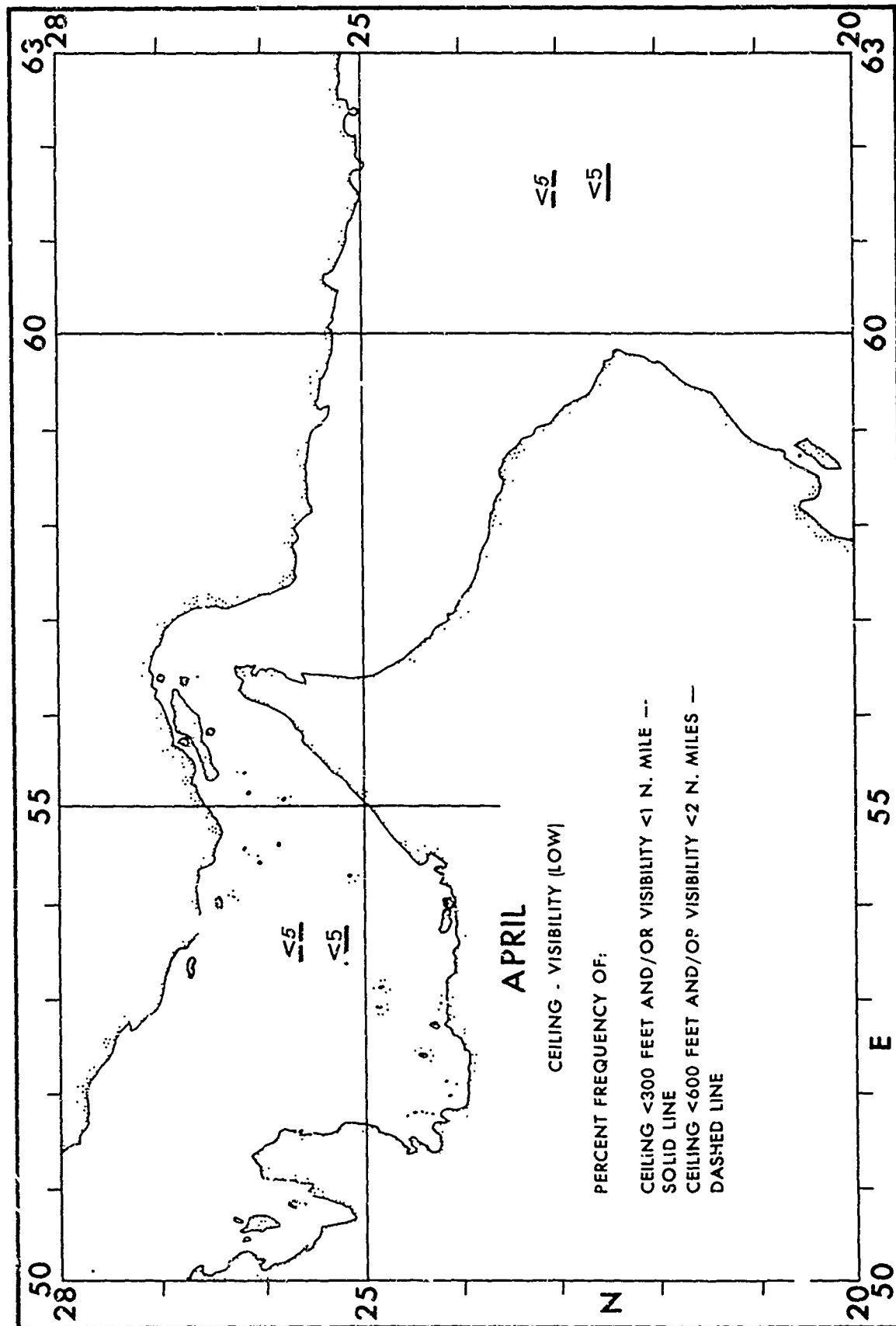
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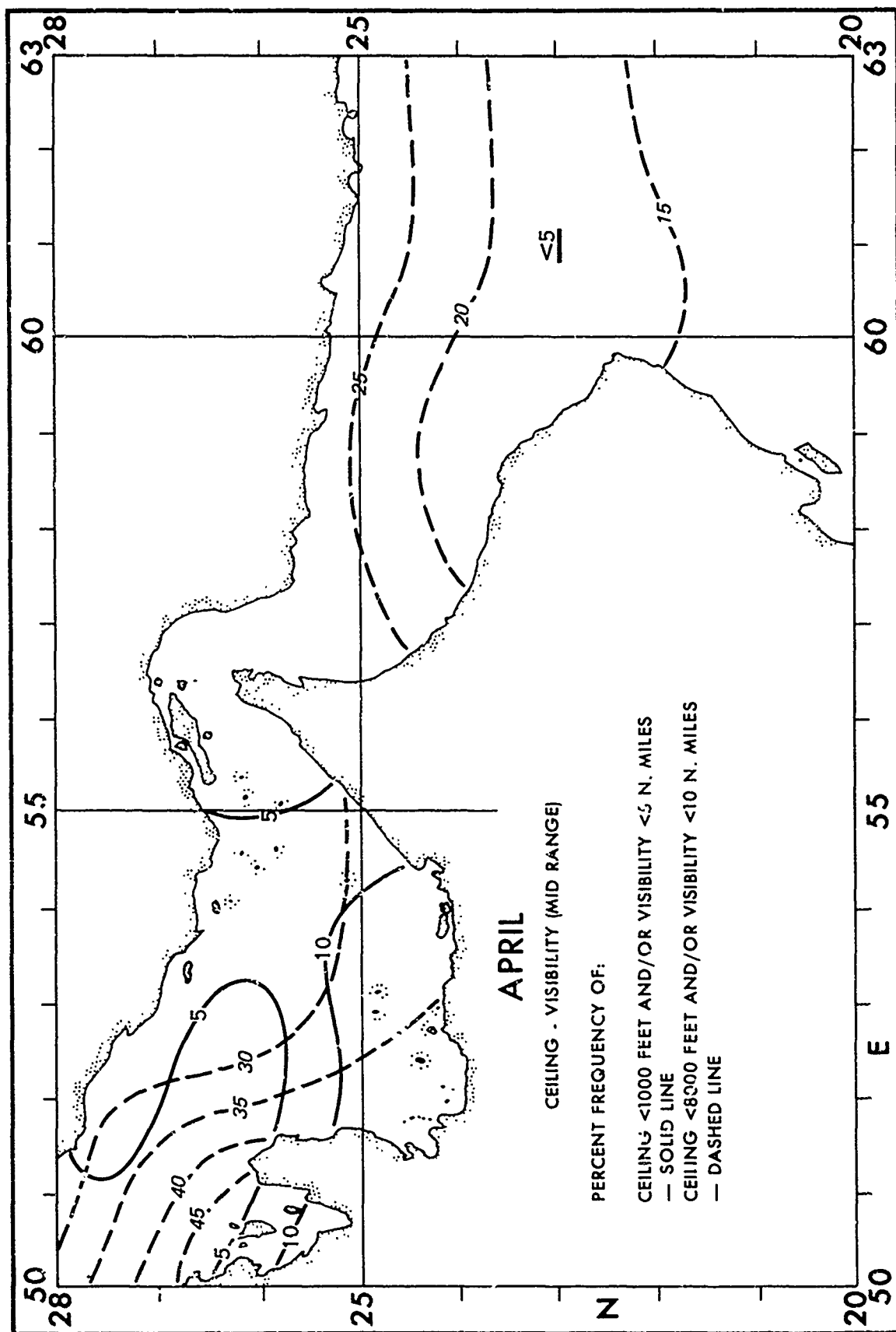
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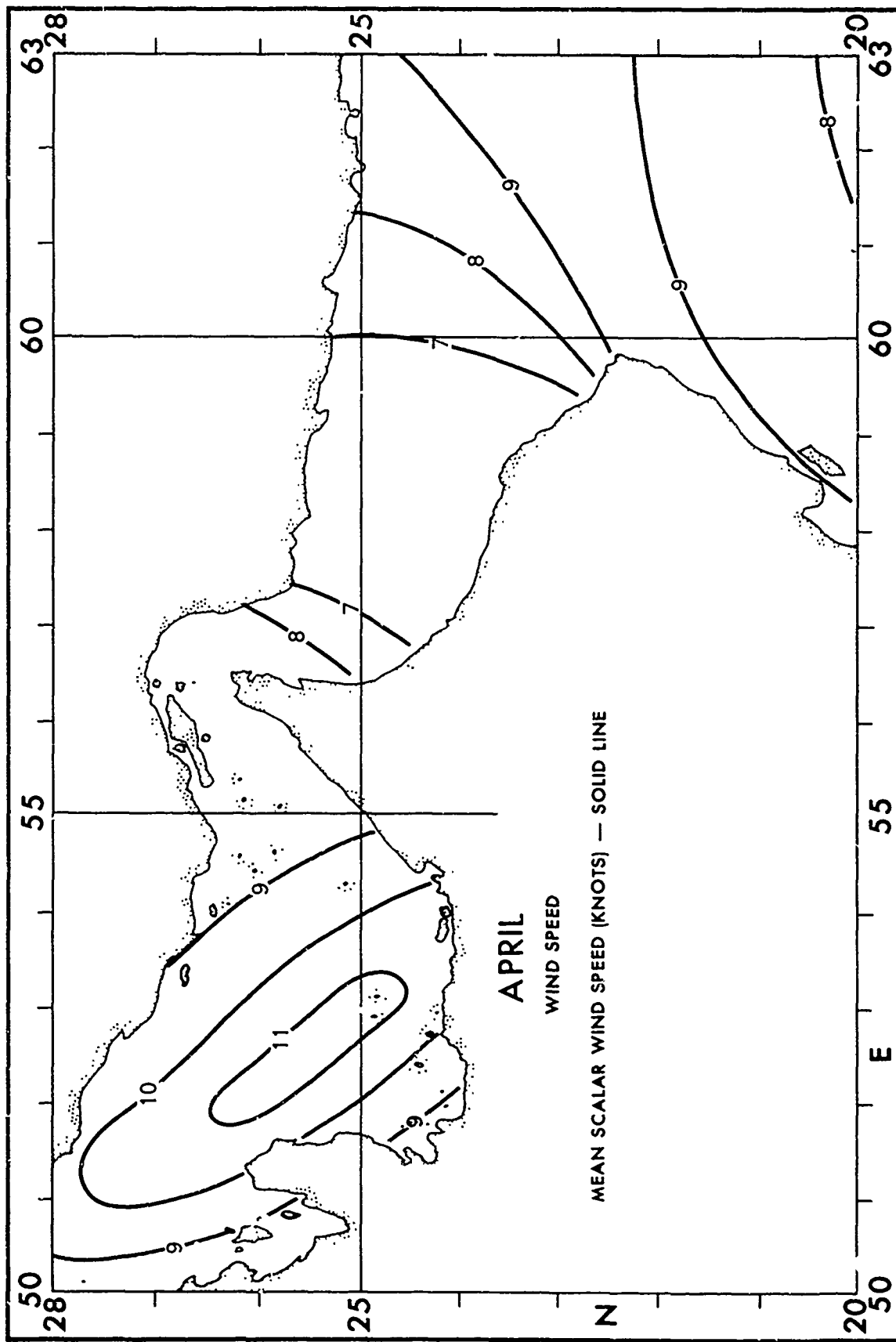
≤2 10.0 30.0% OF ALL OBSERVED WAVE HEIGHTS  
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 5-6 30.0 N = OBSERVATION COUNT.  
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 ≥13 10.0 SWELL WHEN BOTH WERE REPORTED.

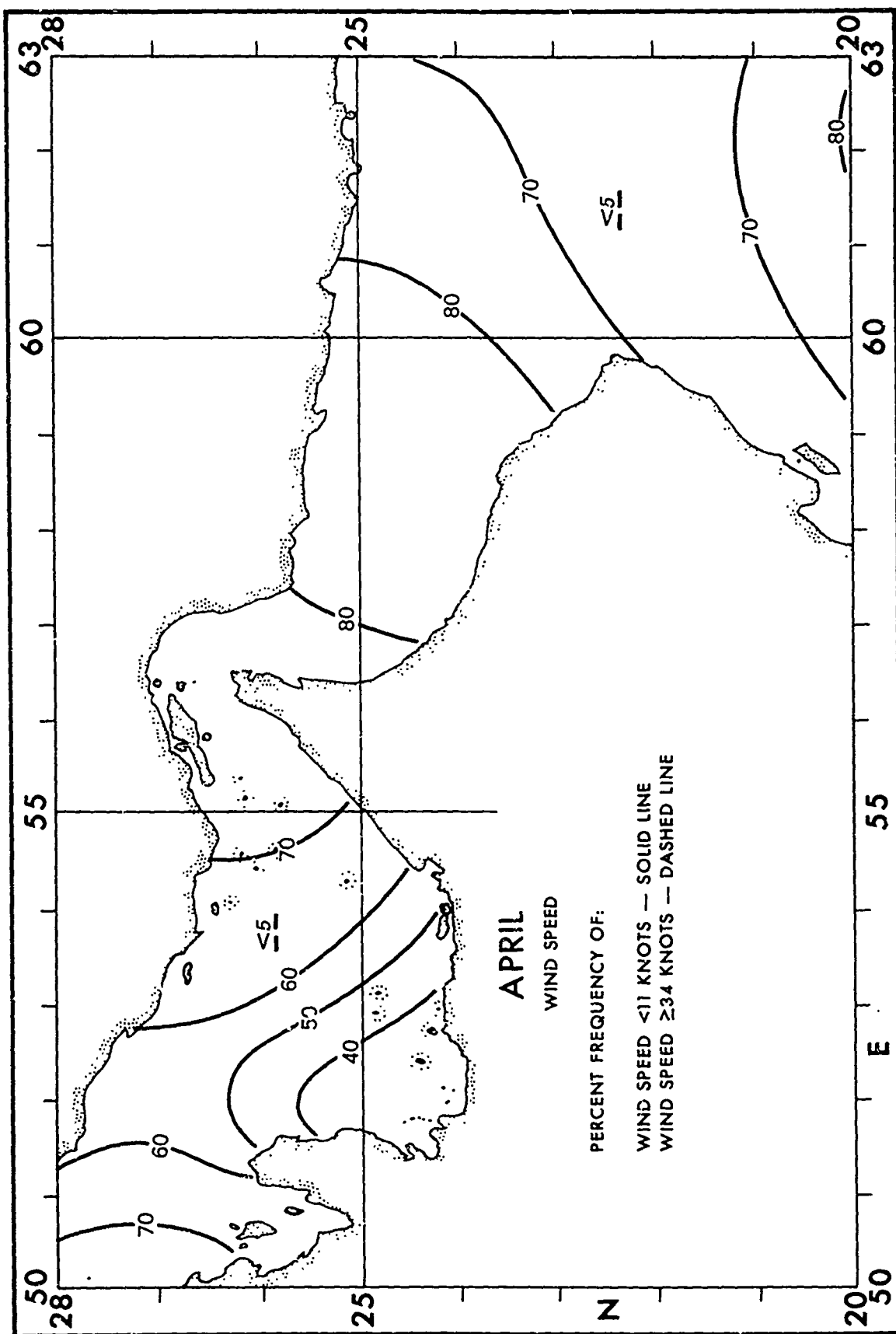
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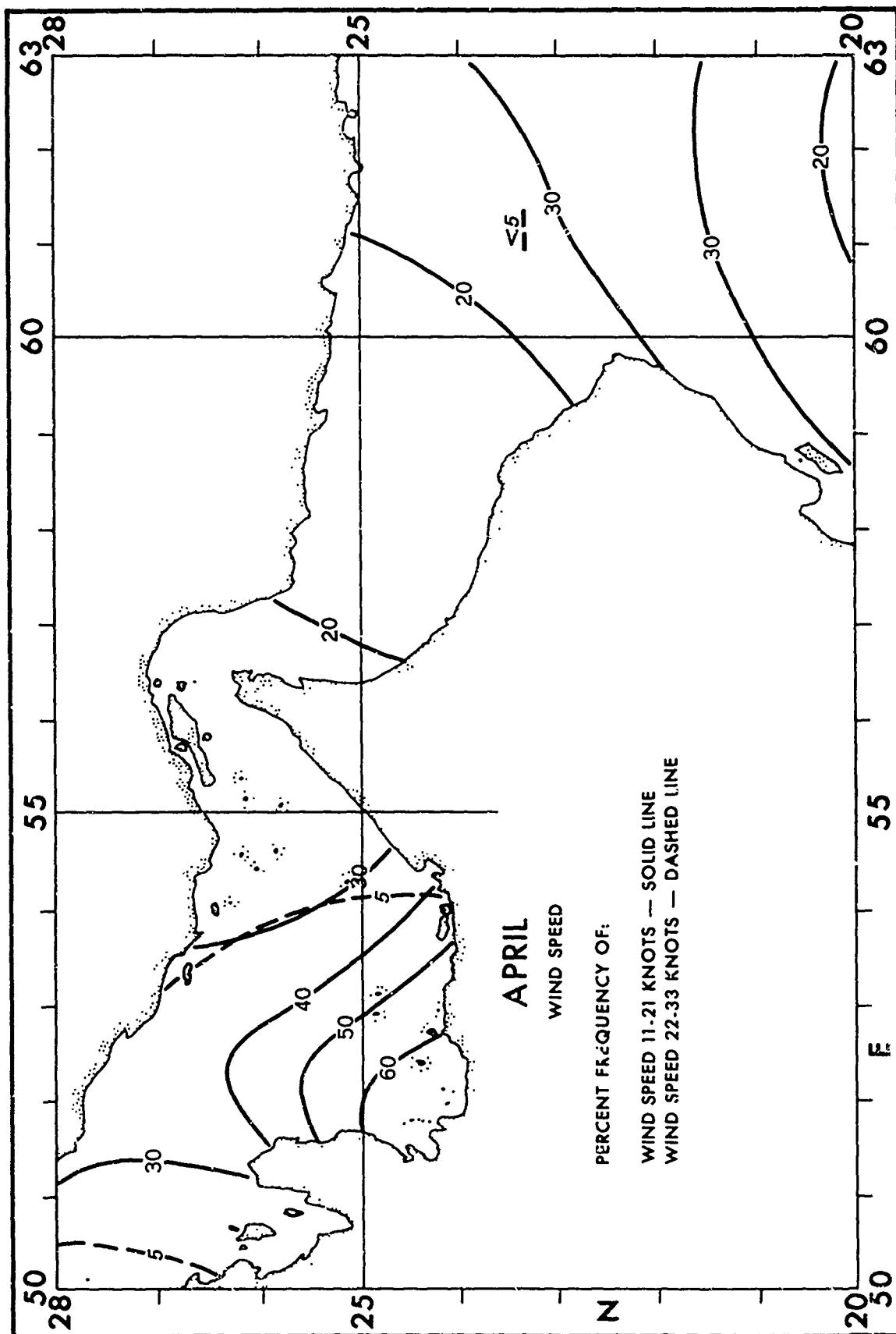


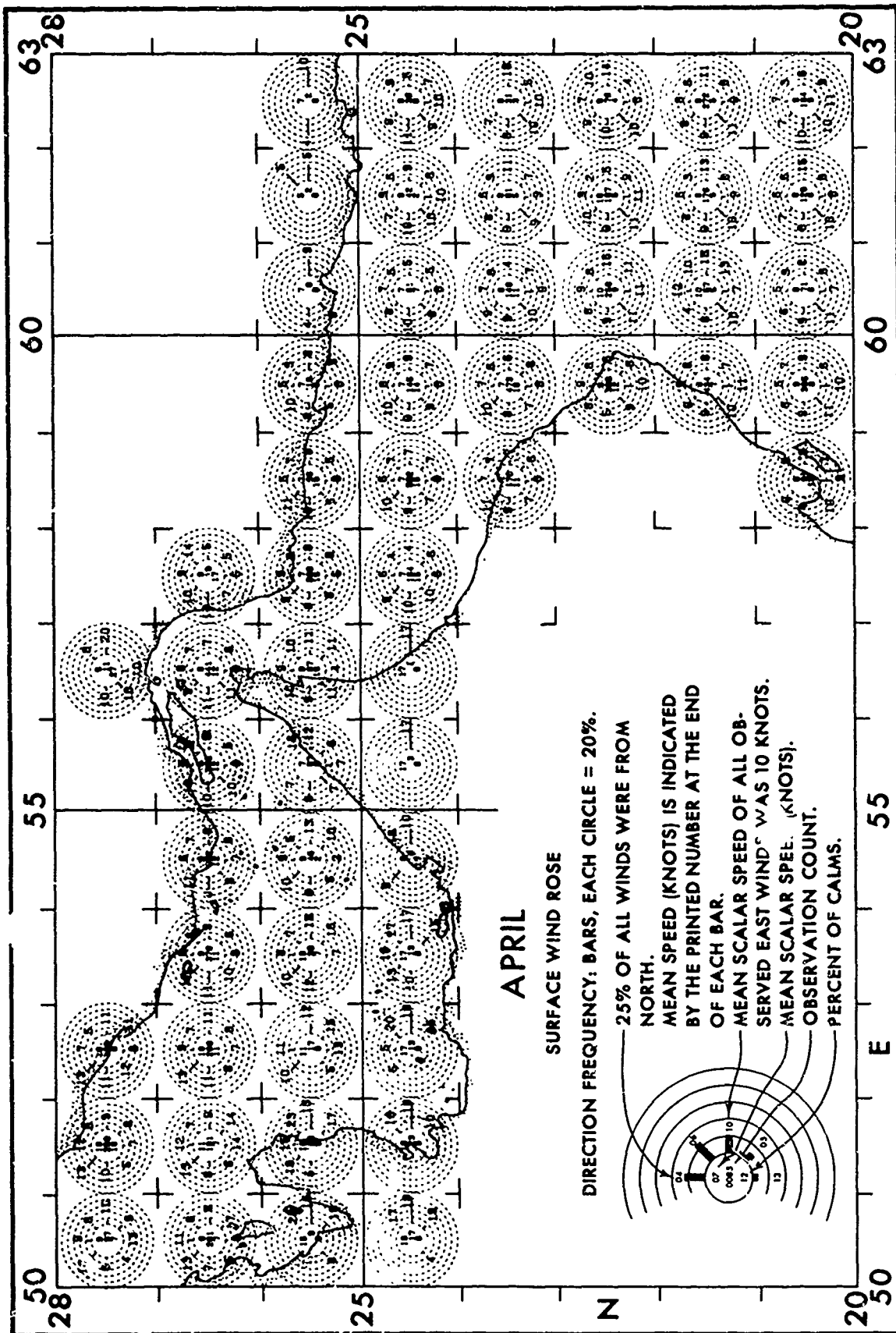


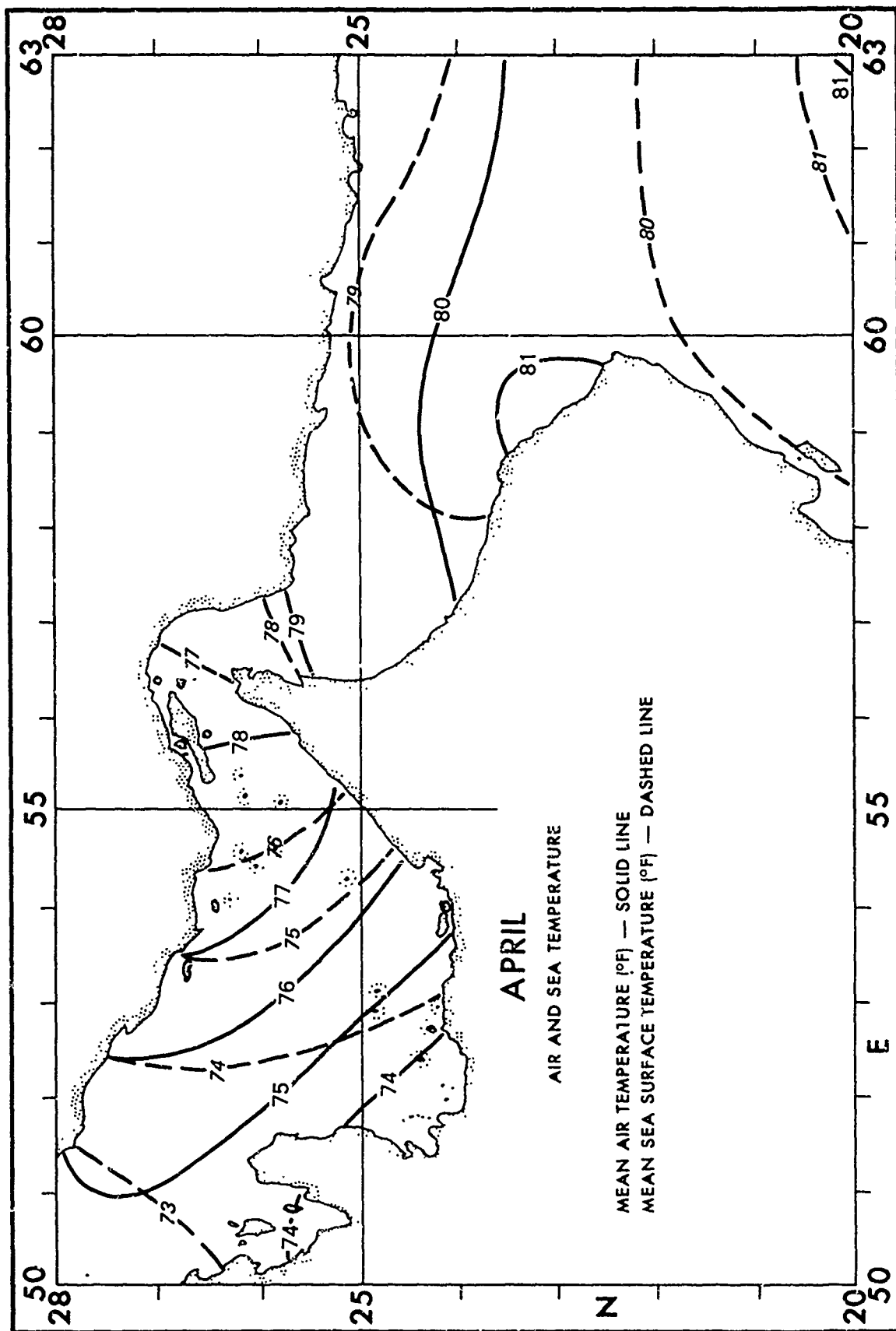


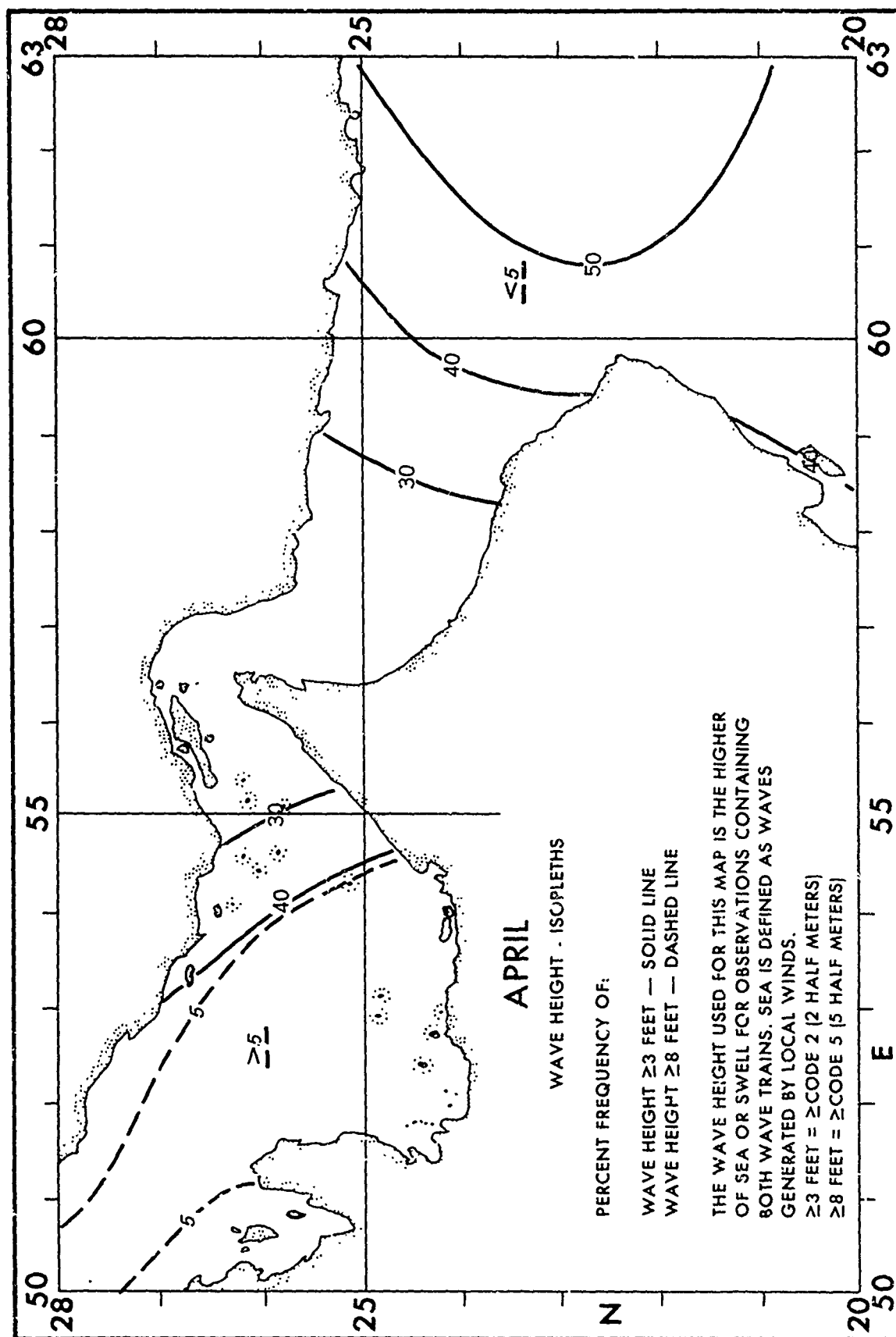


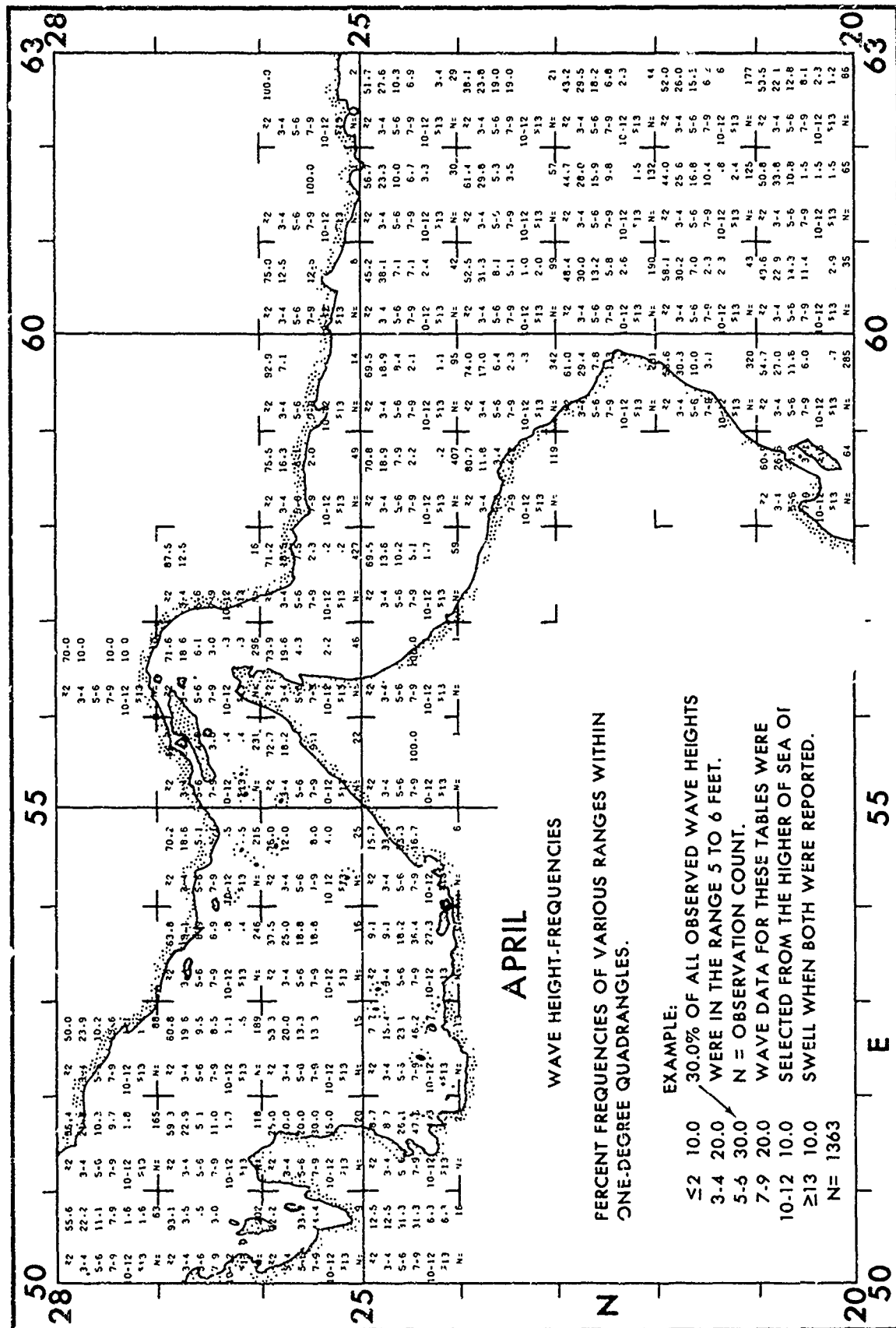


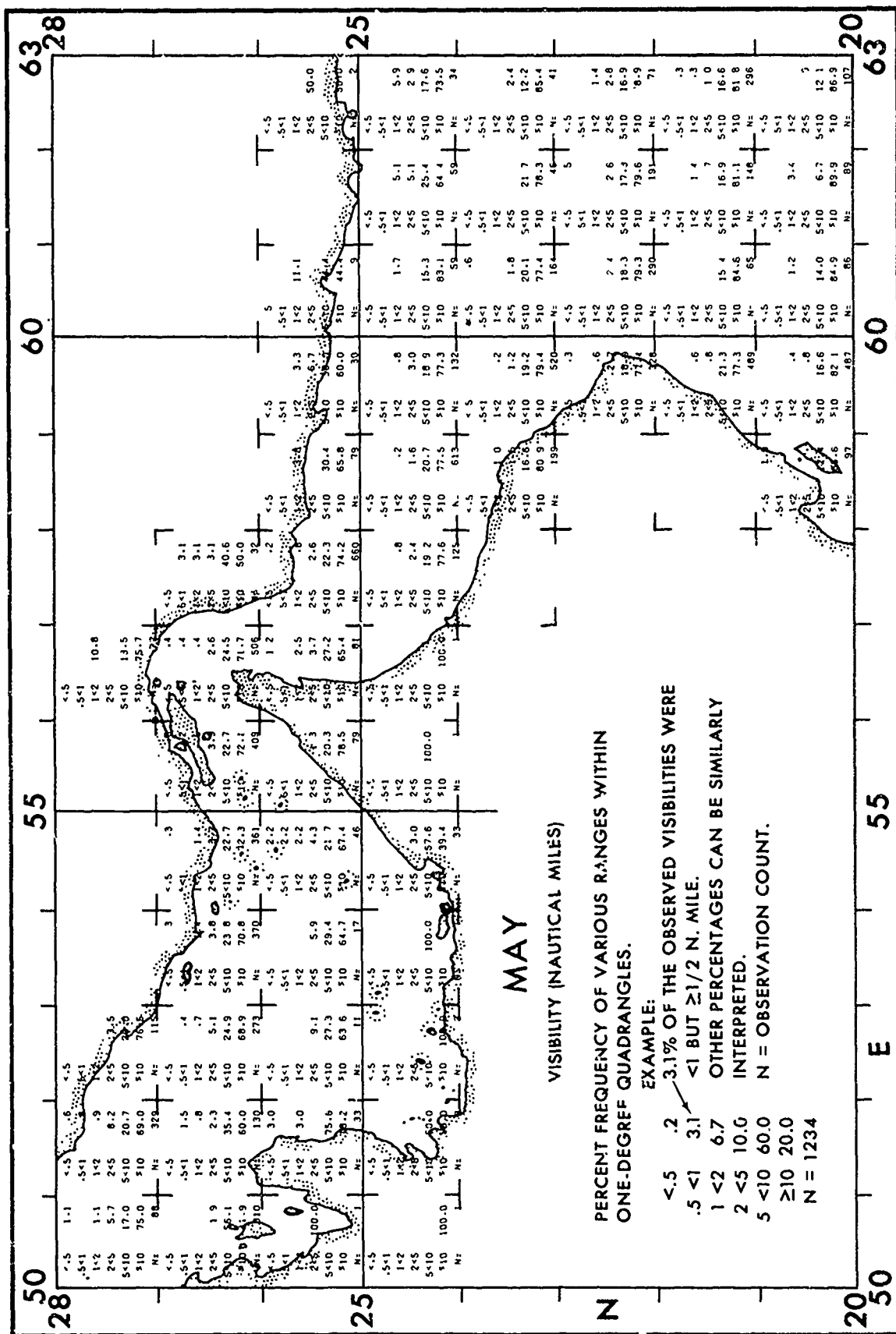


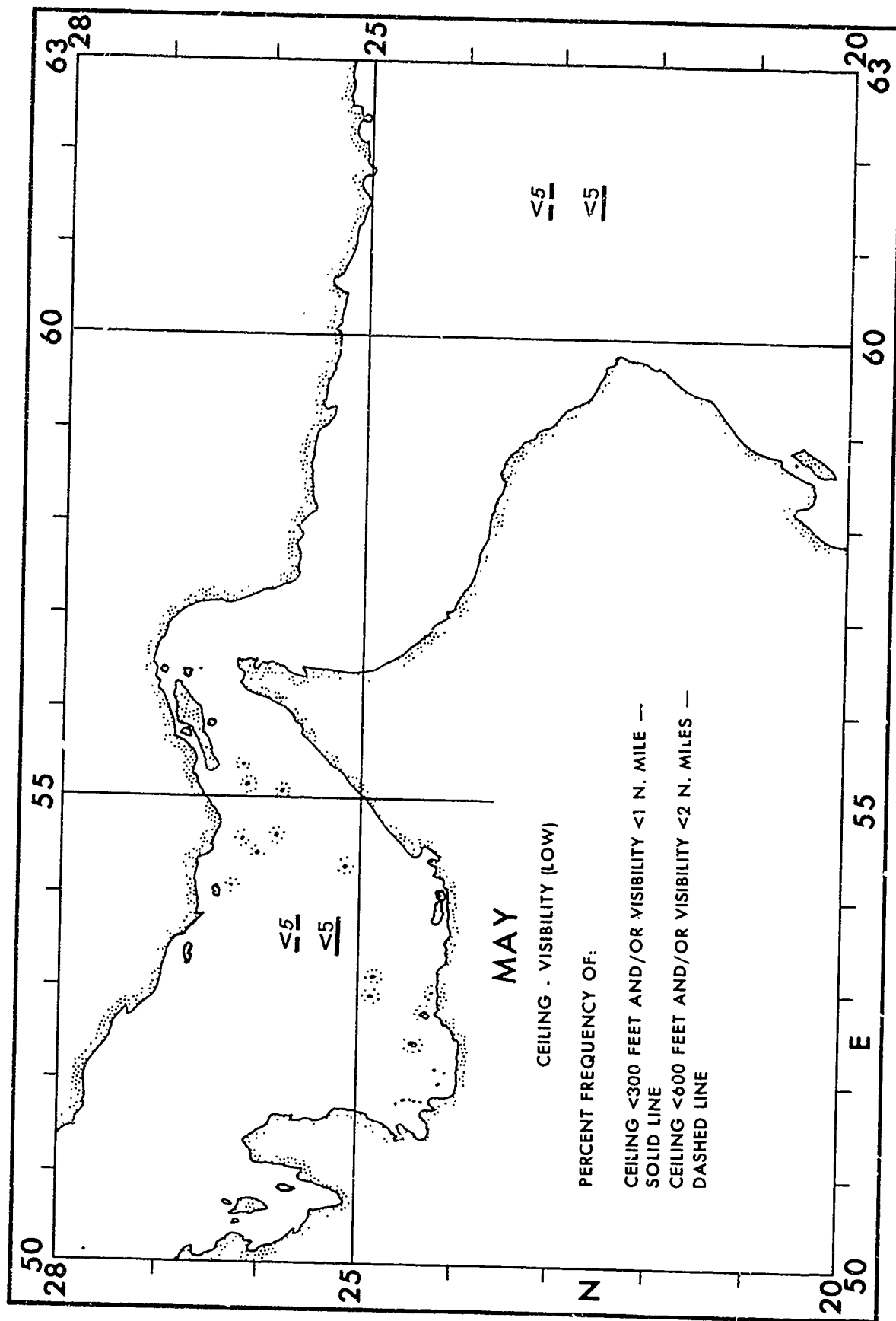


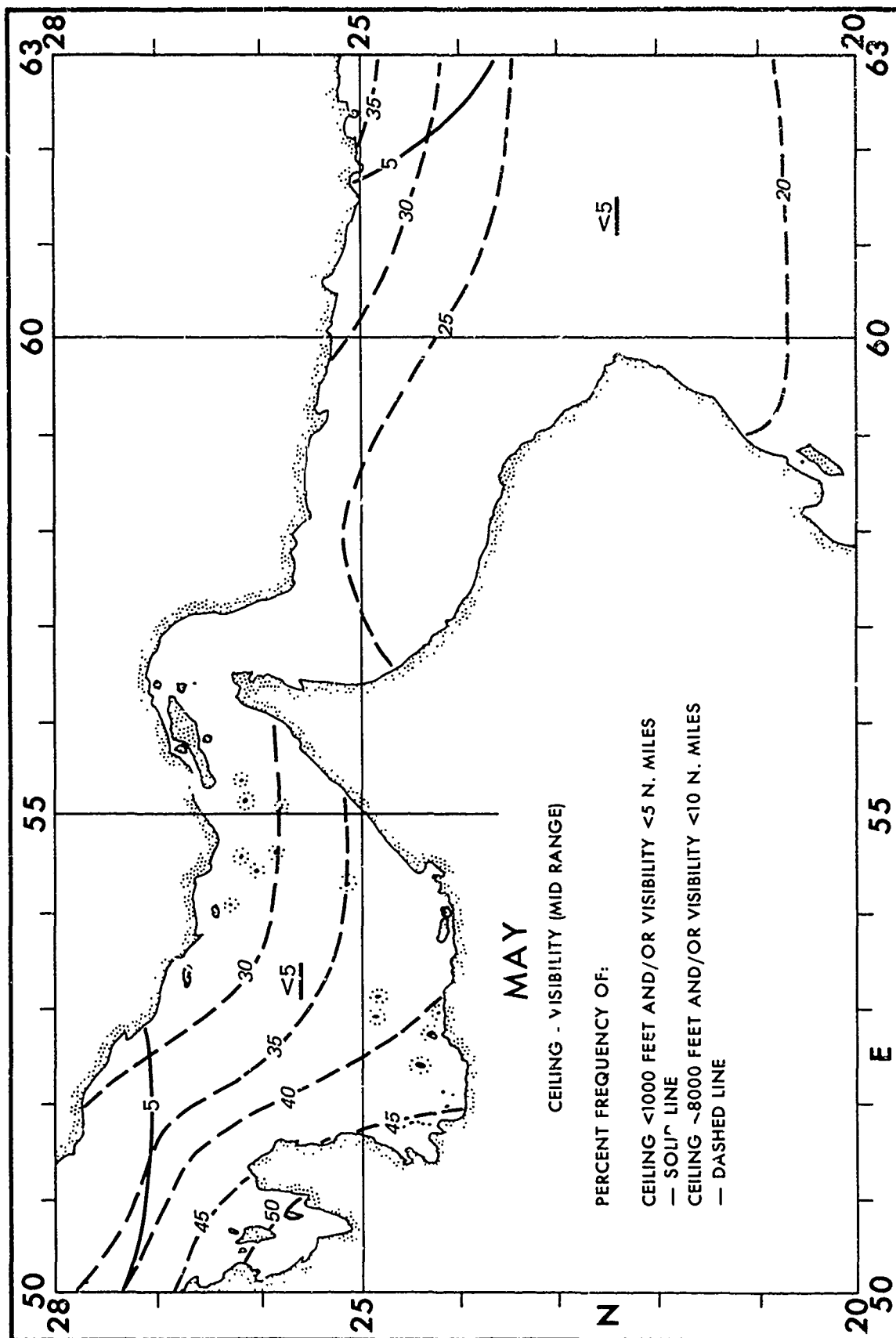


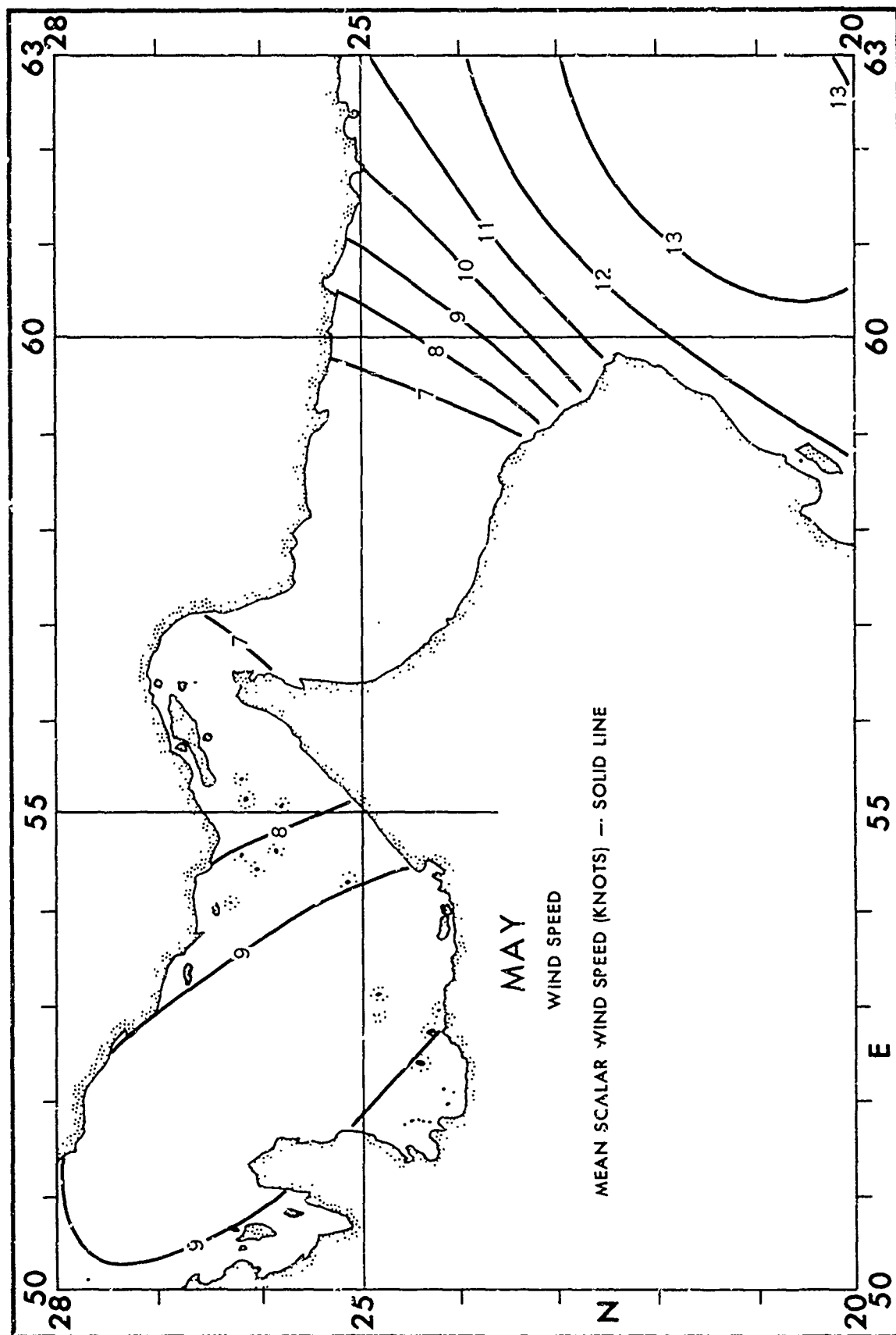


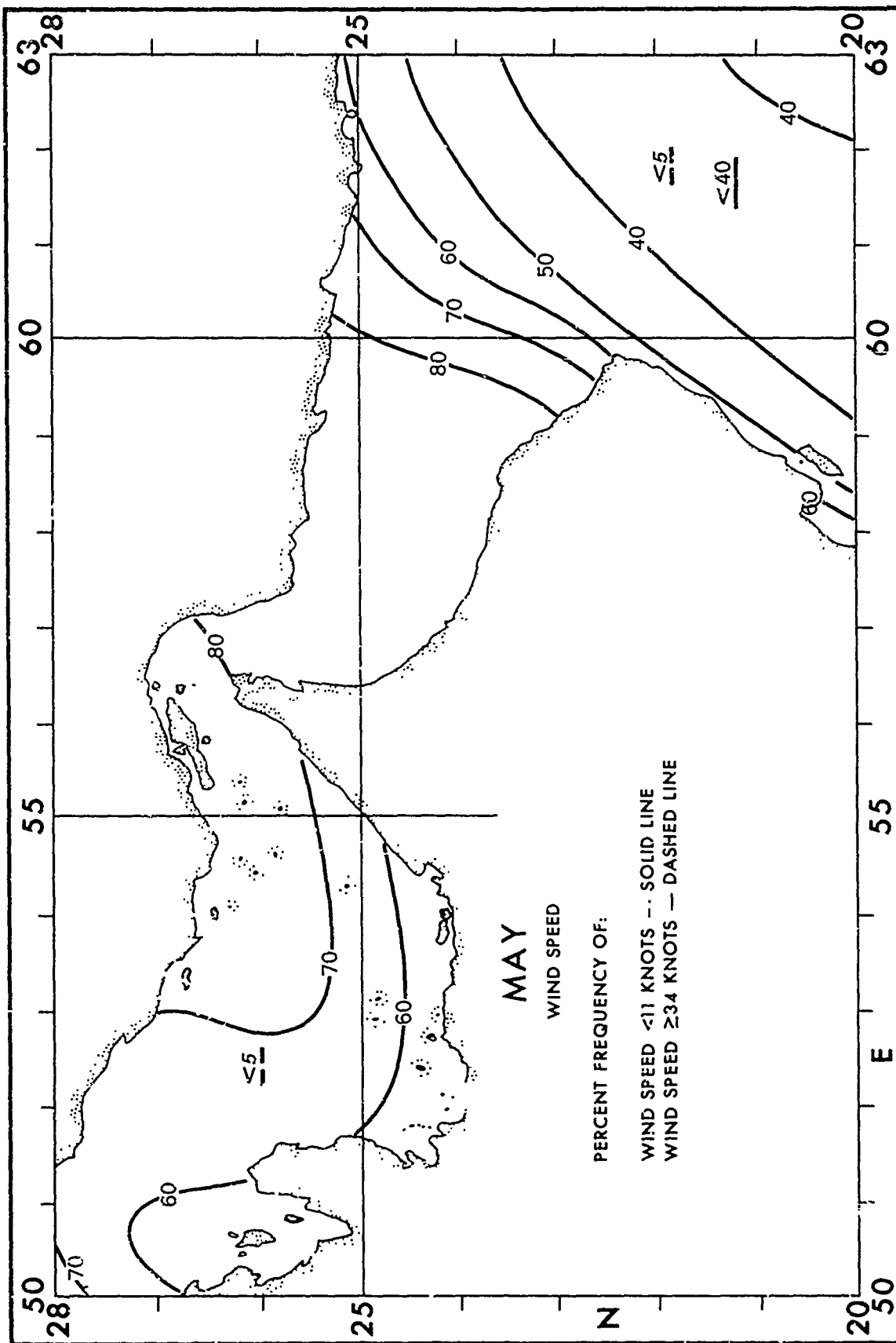


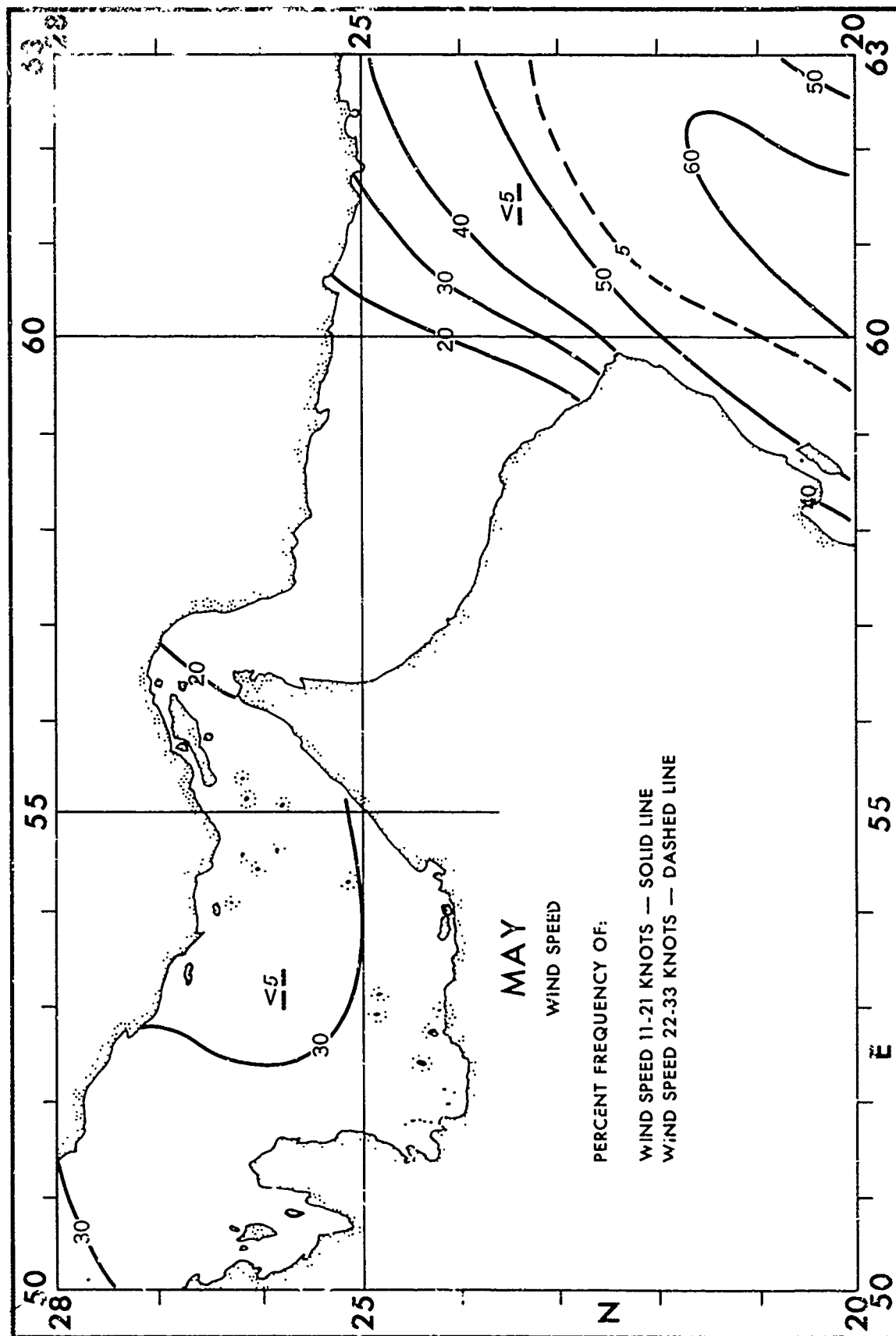


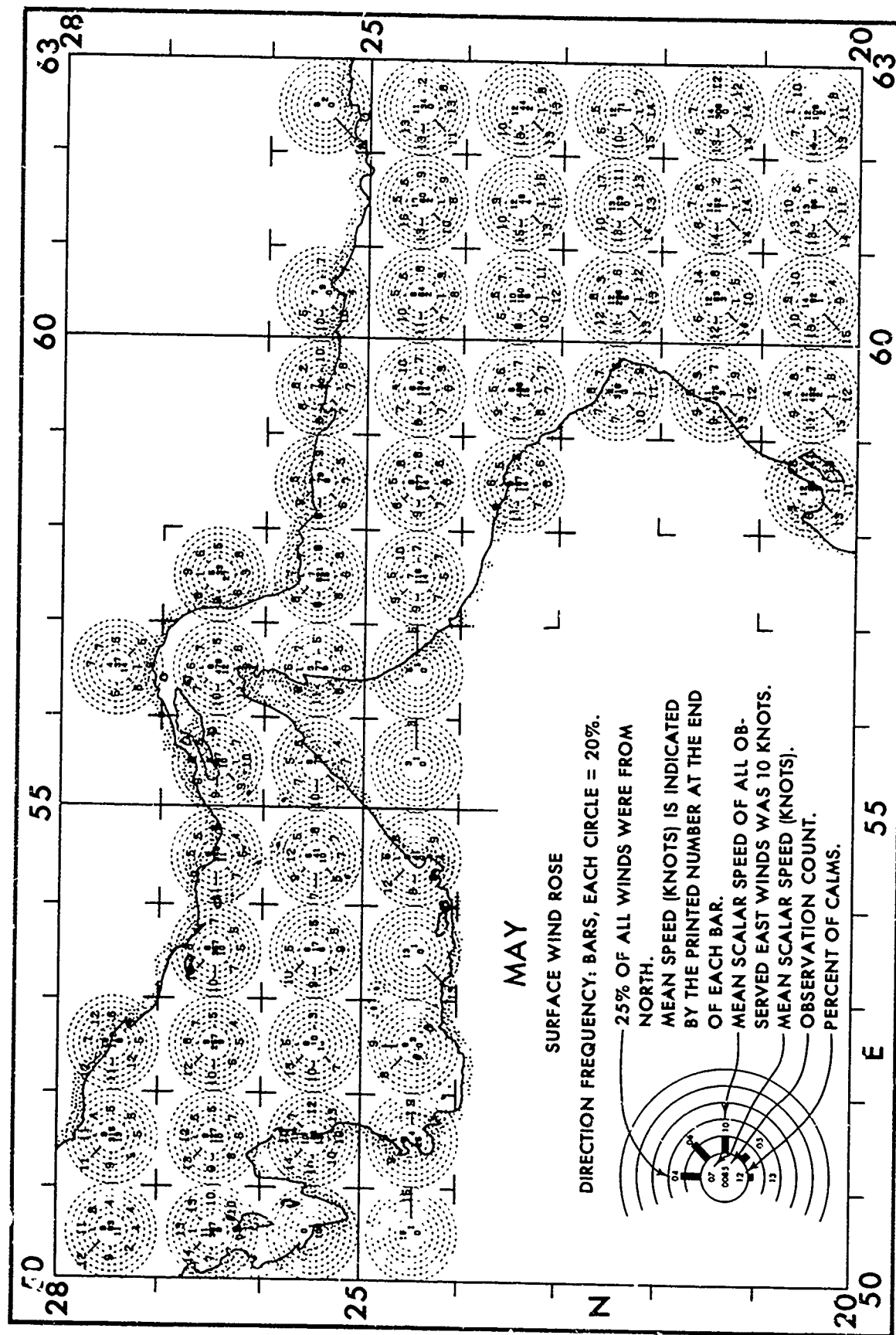


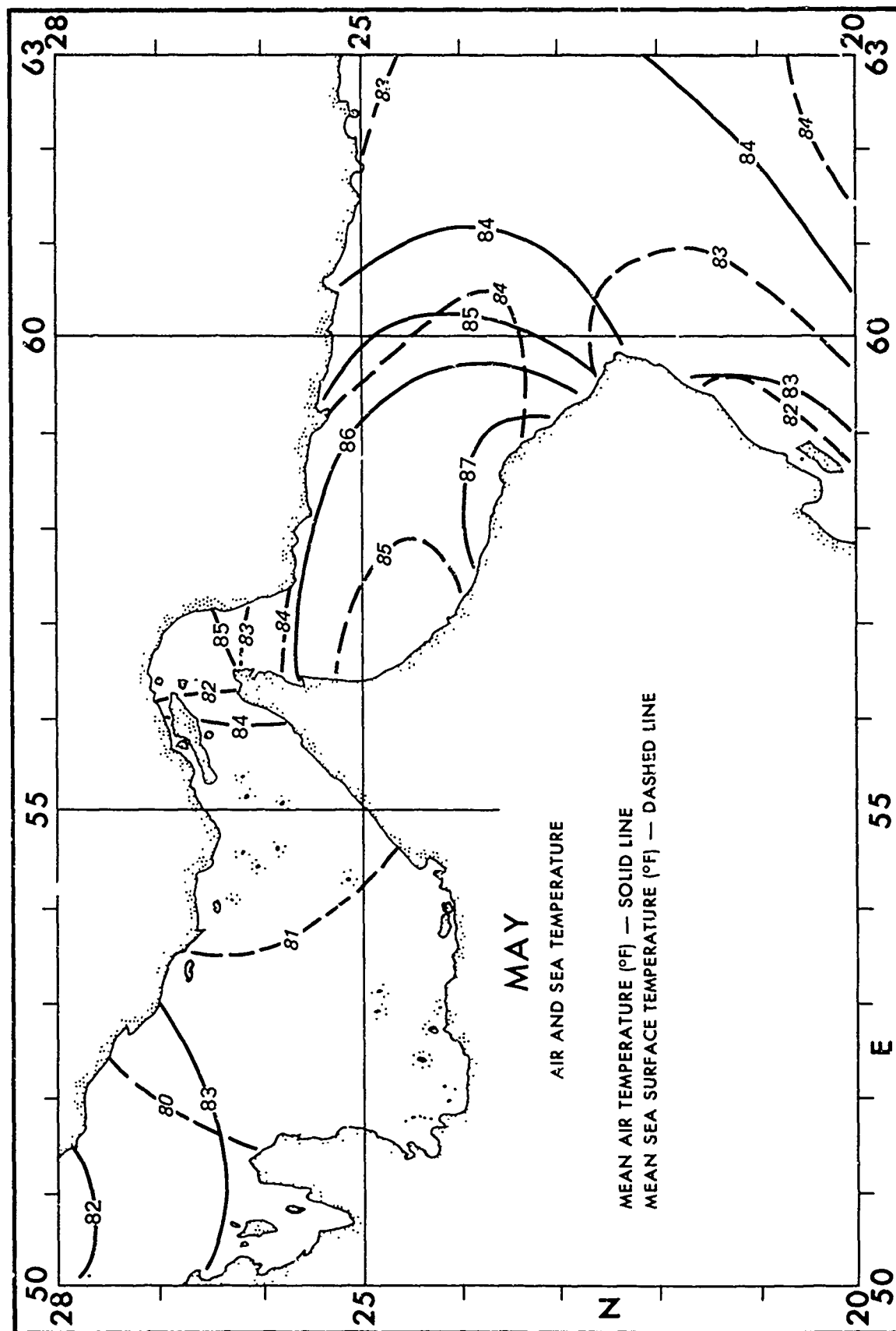


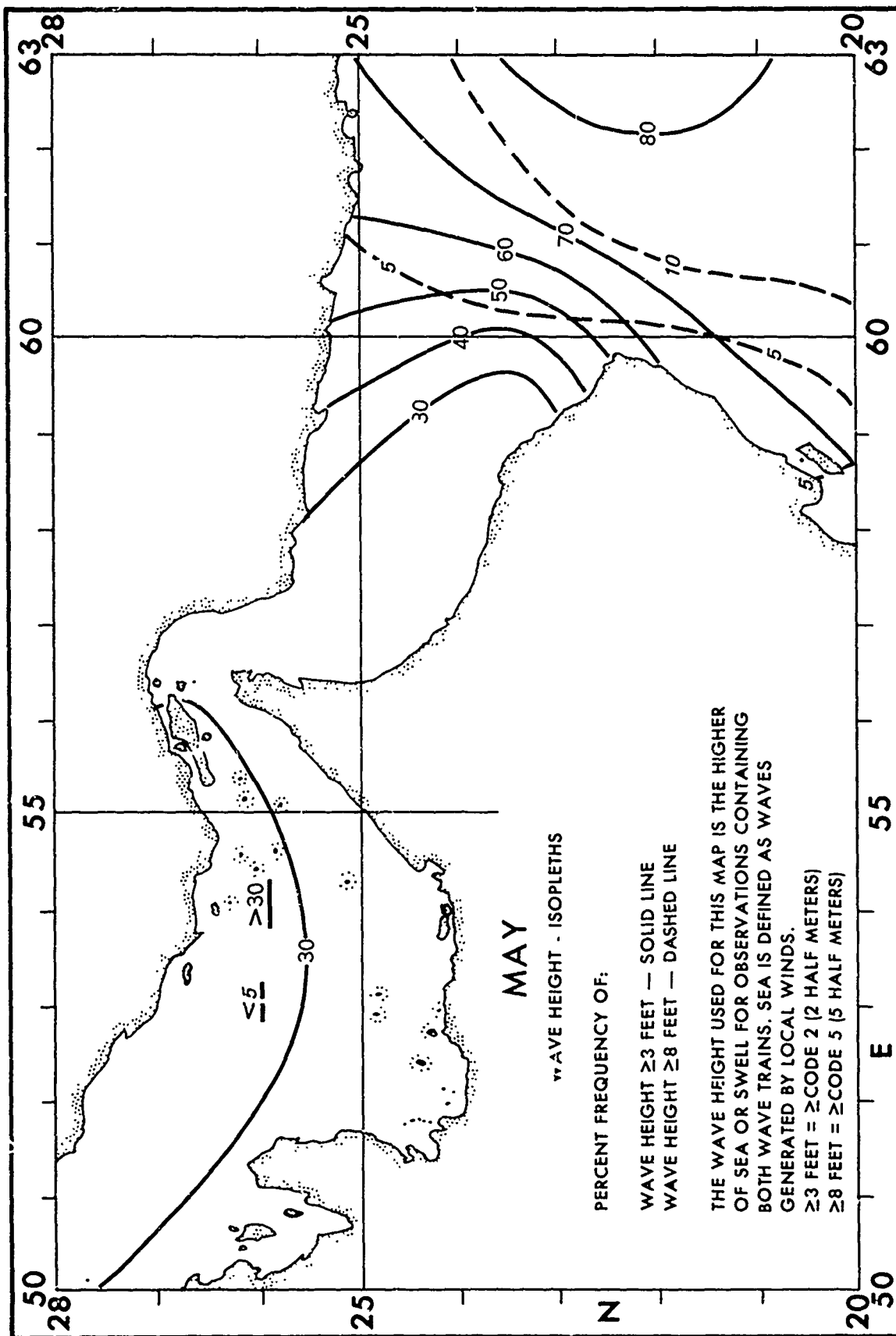


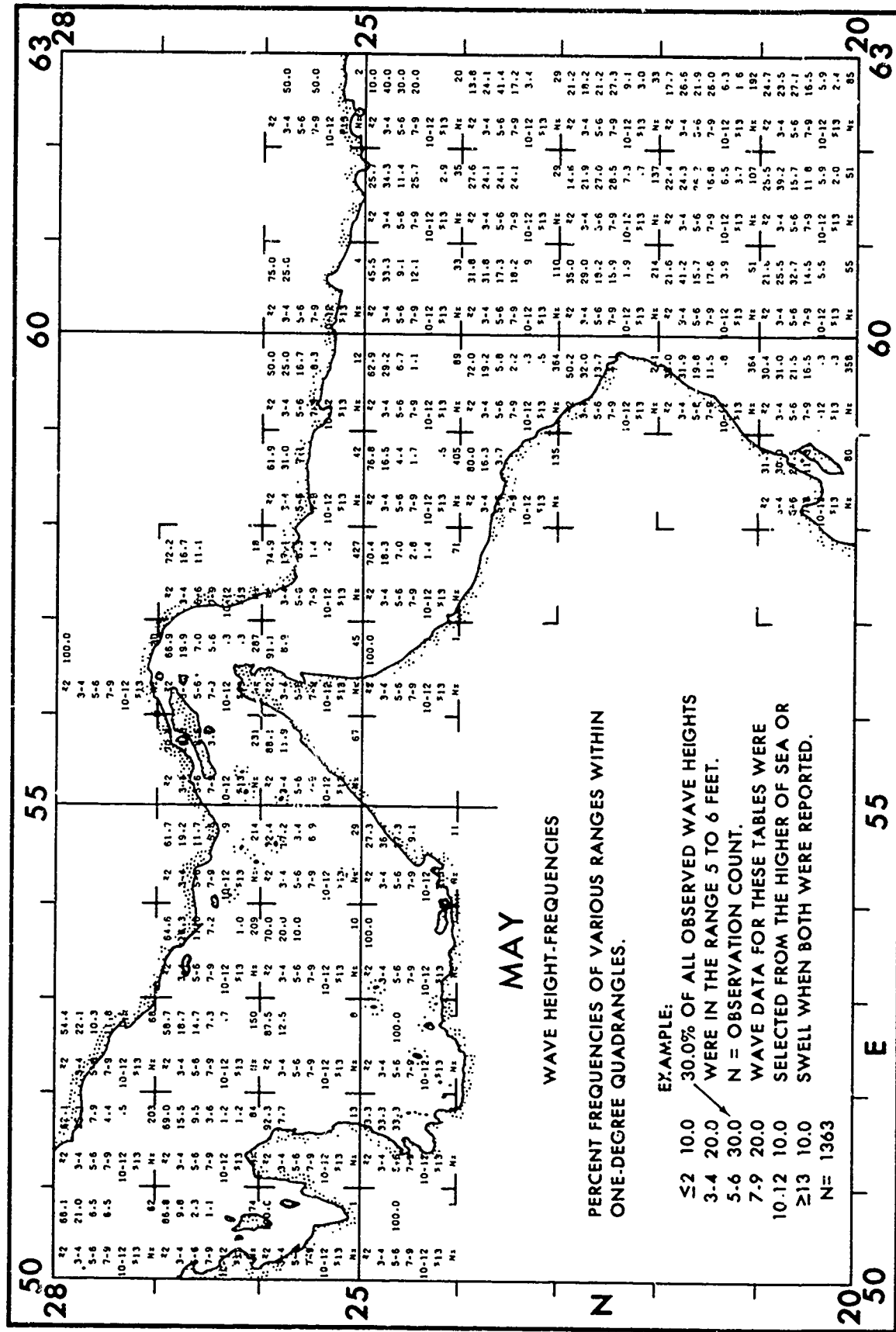


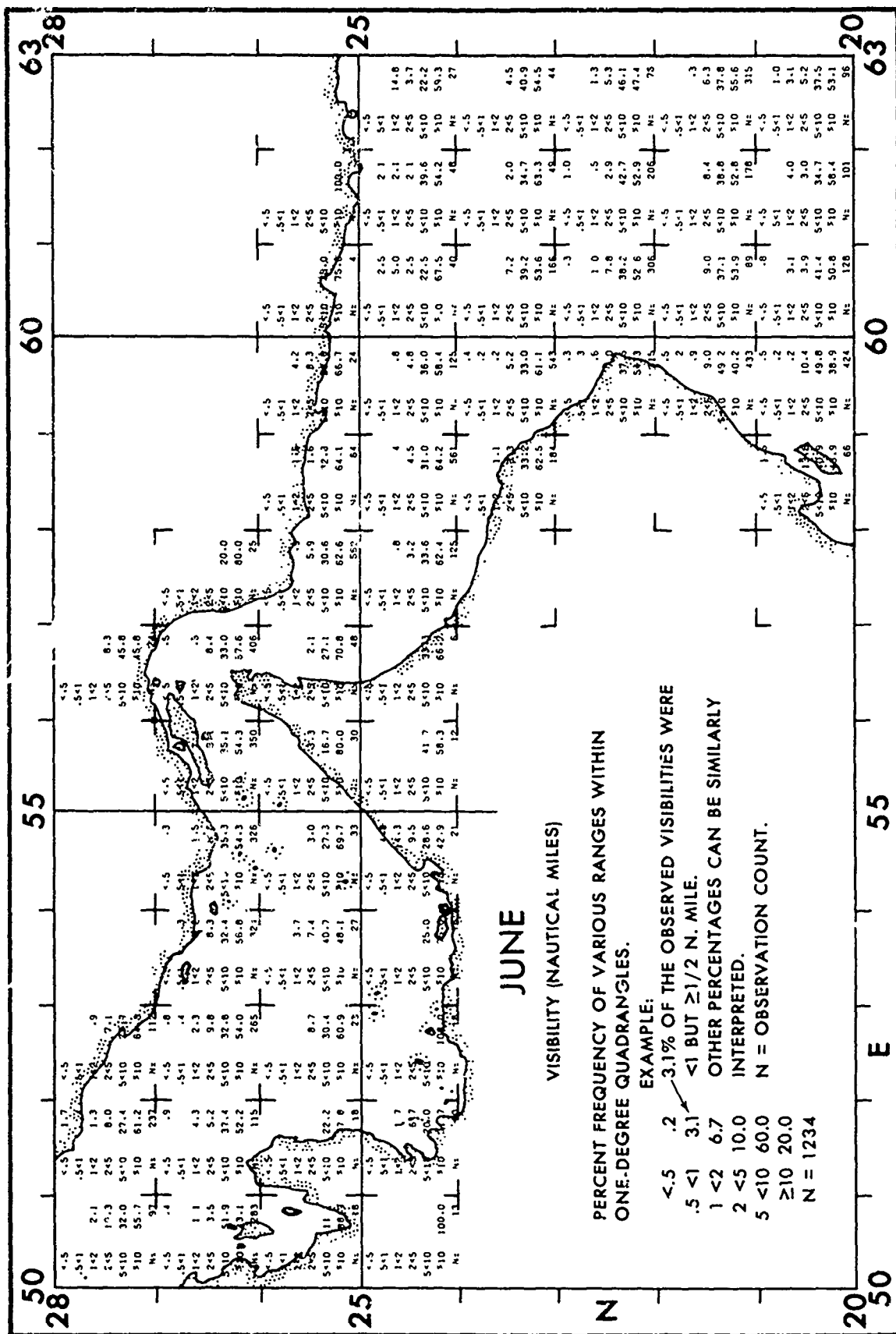


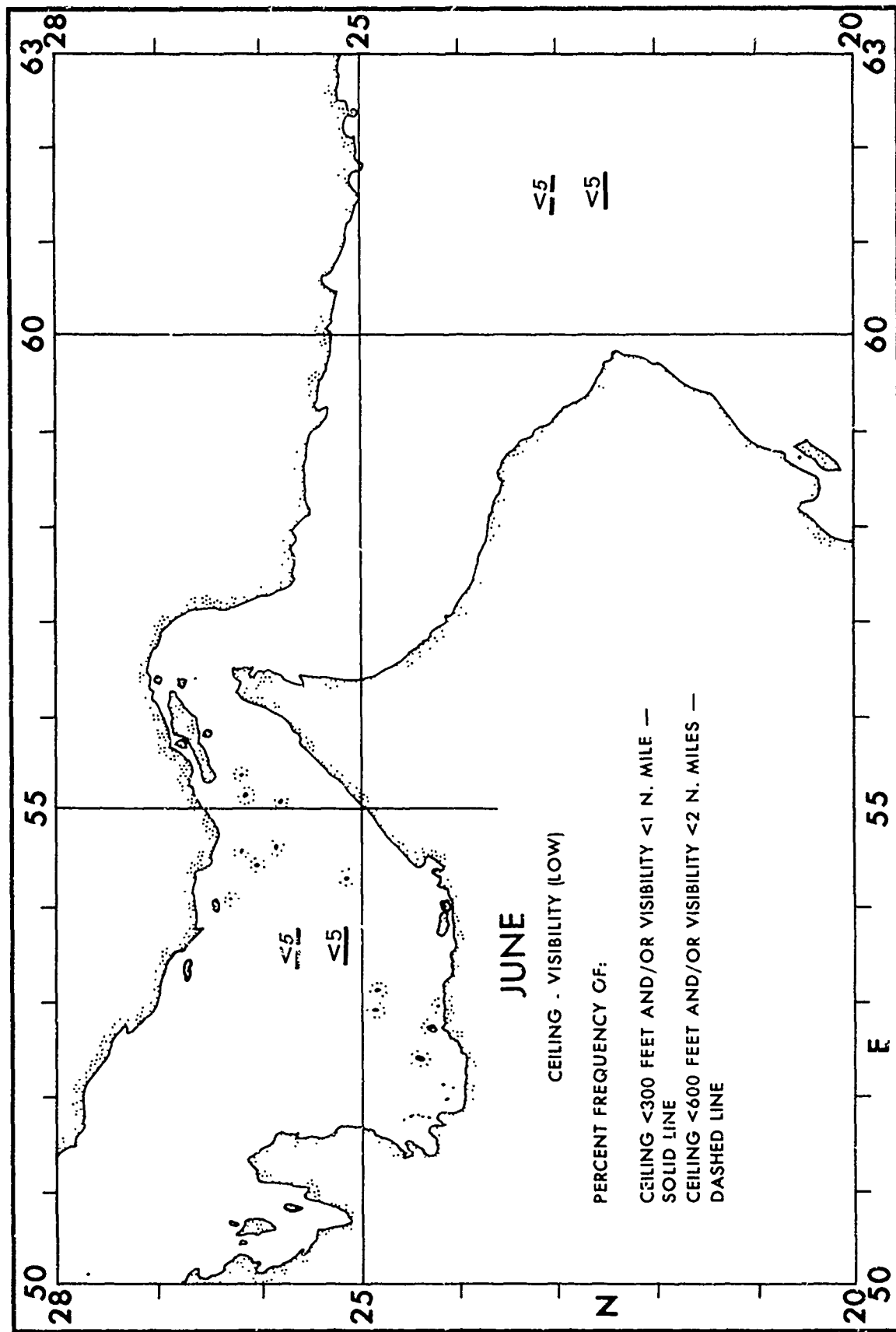


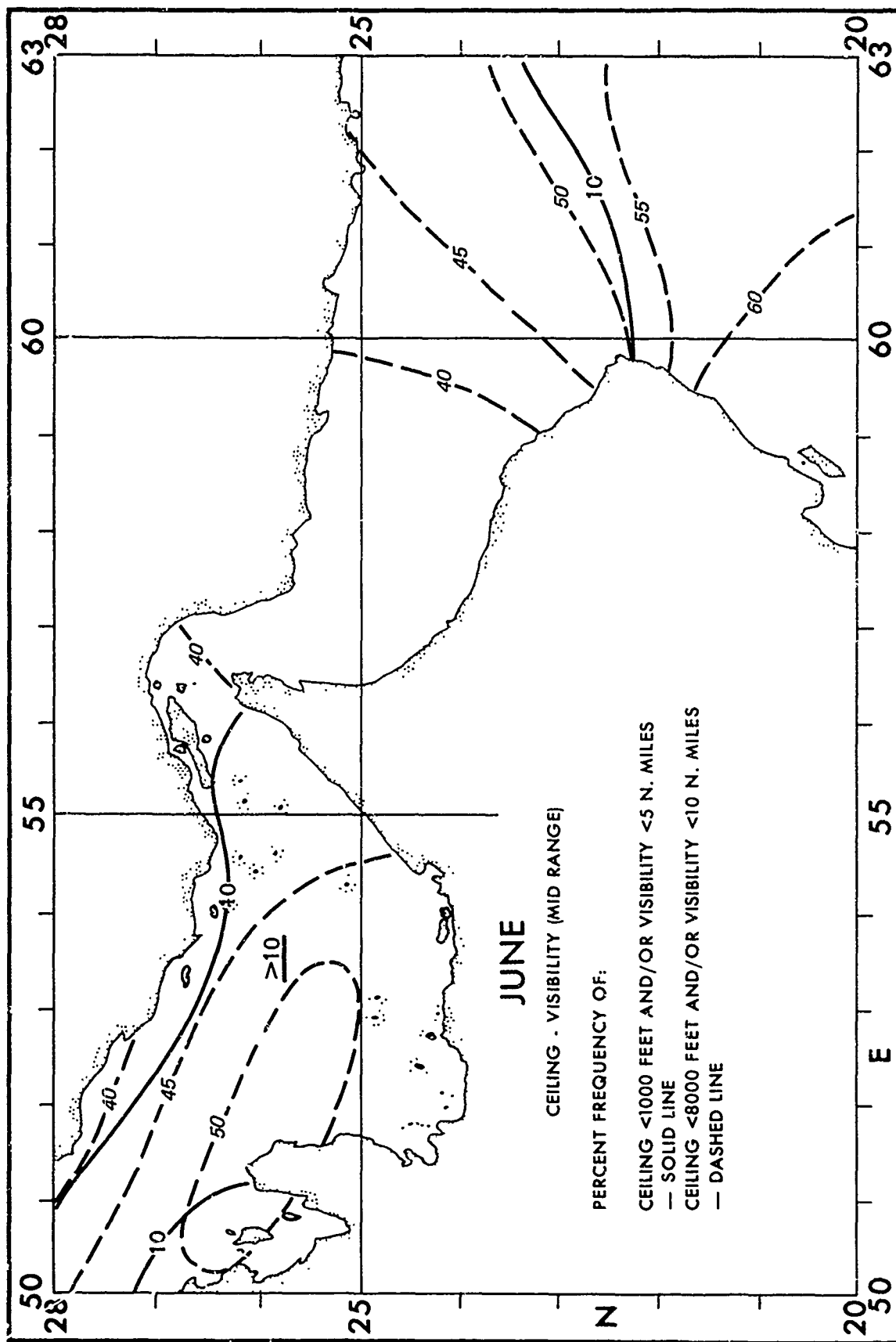


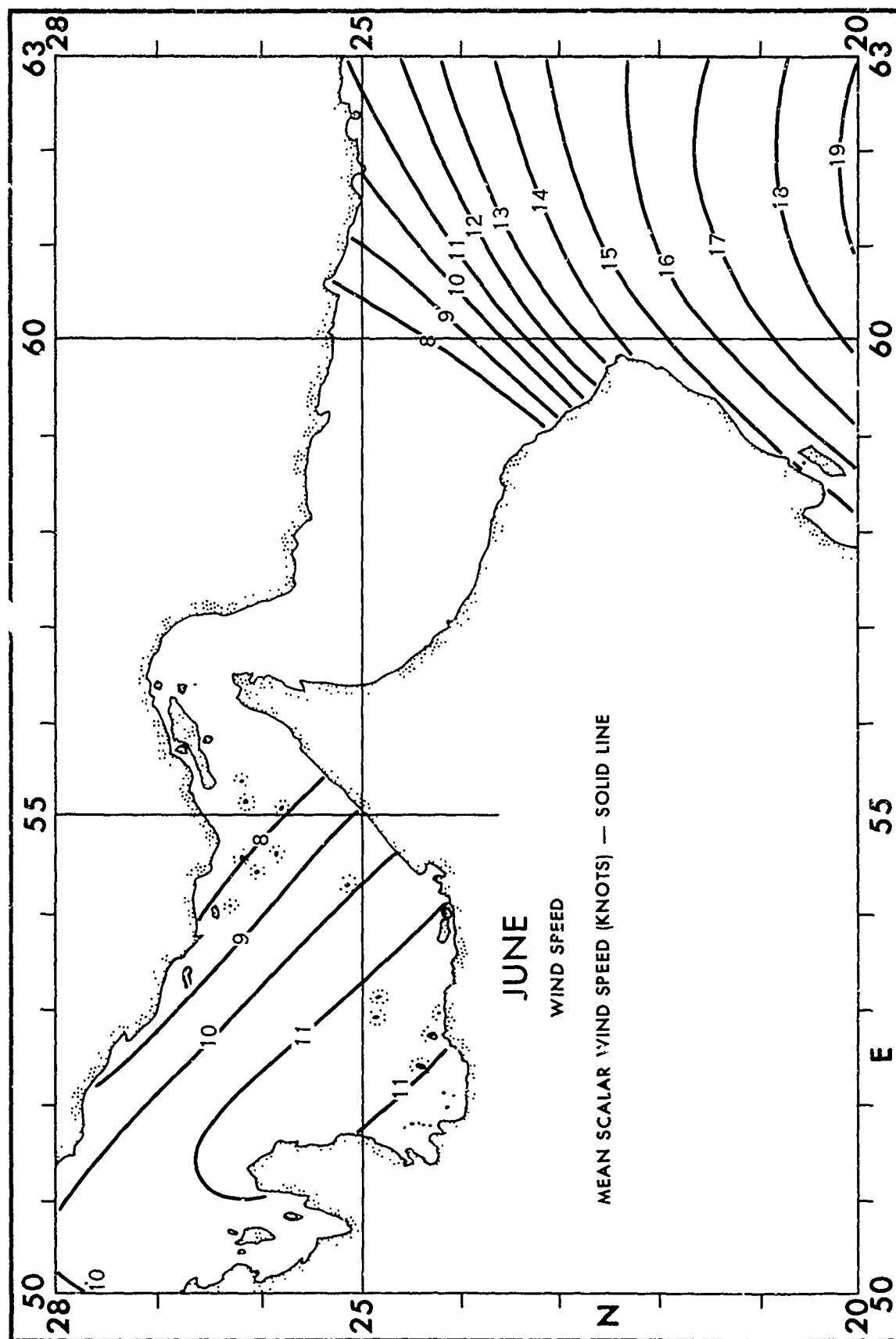


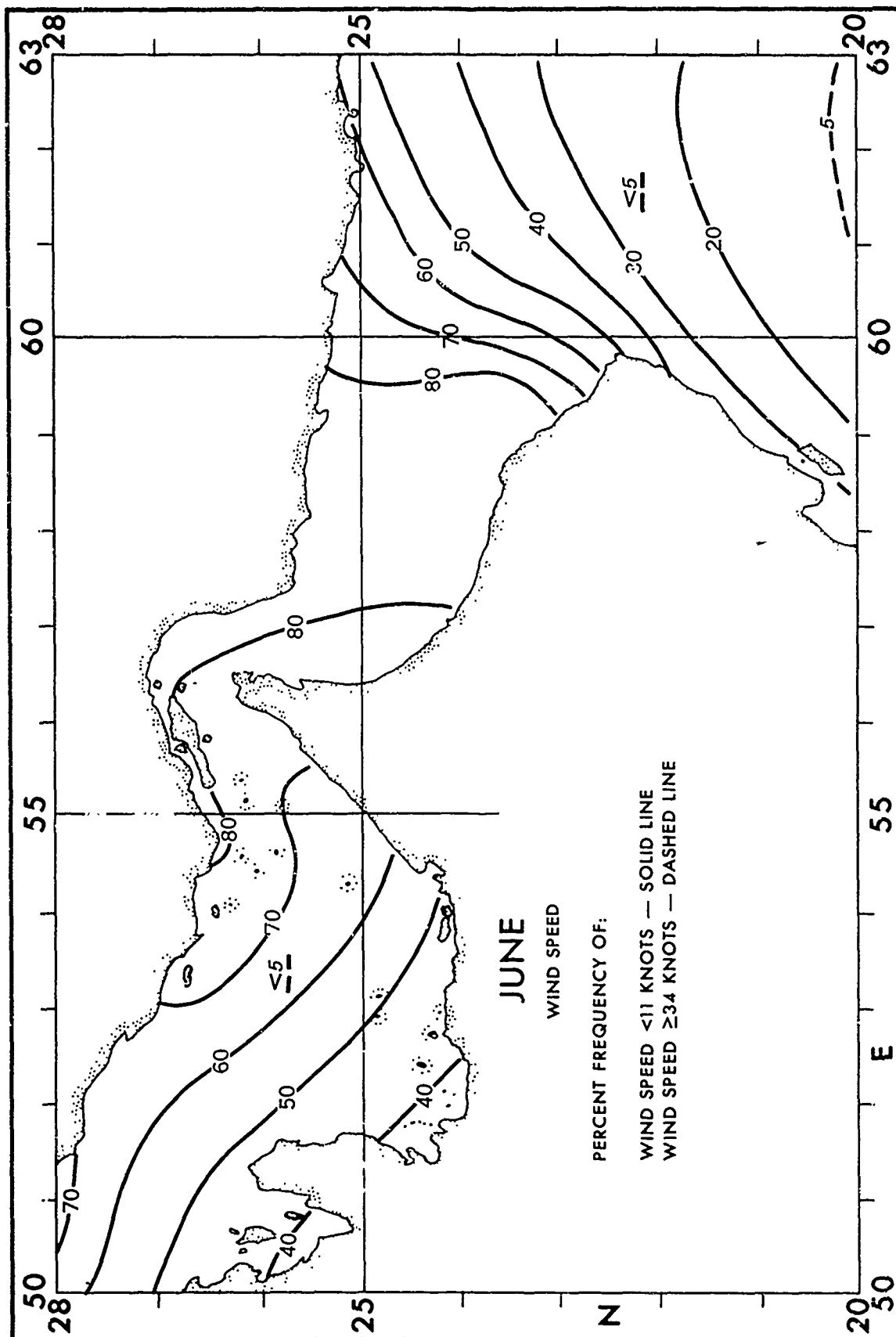


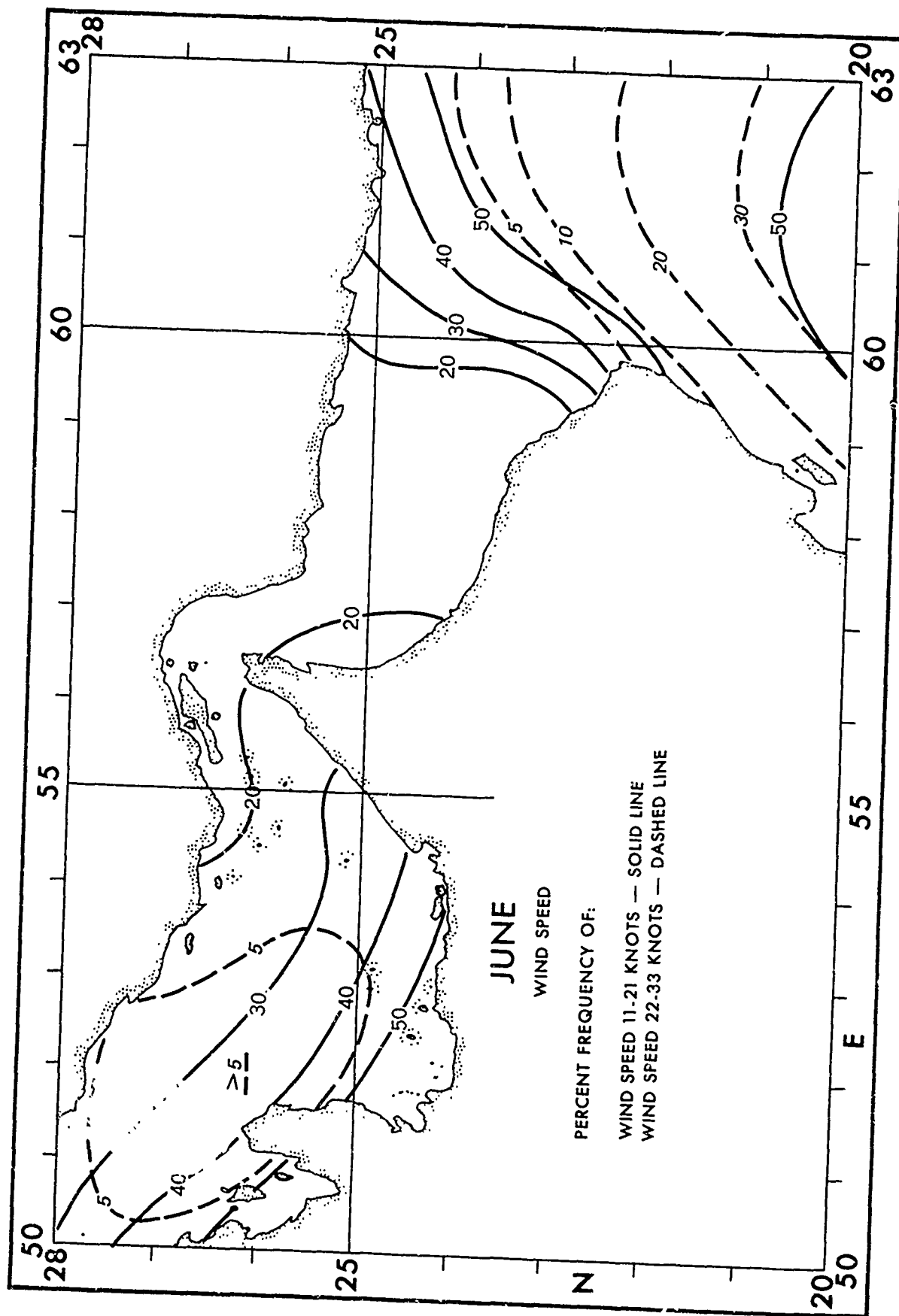


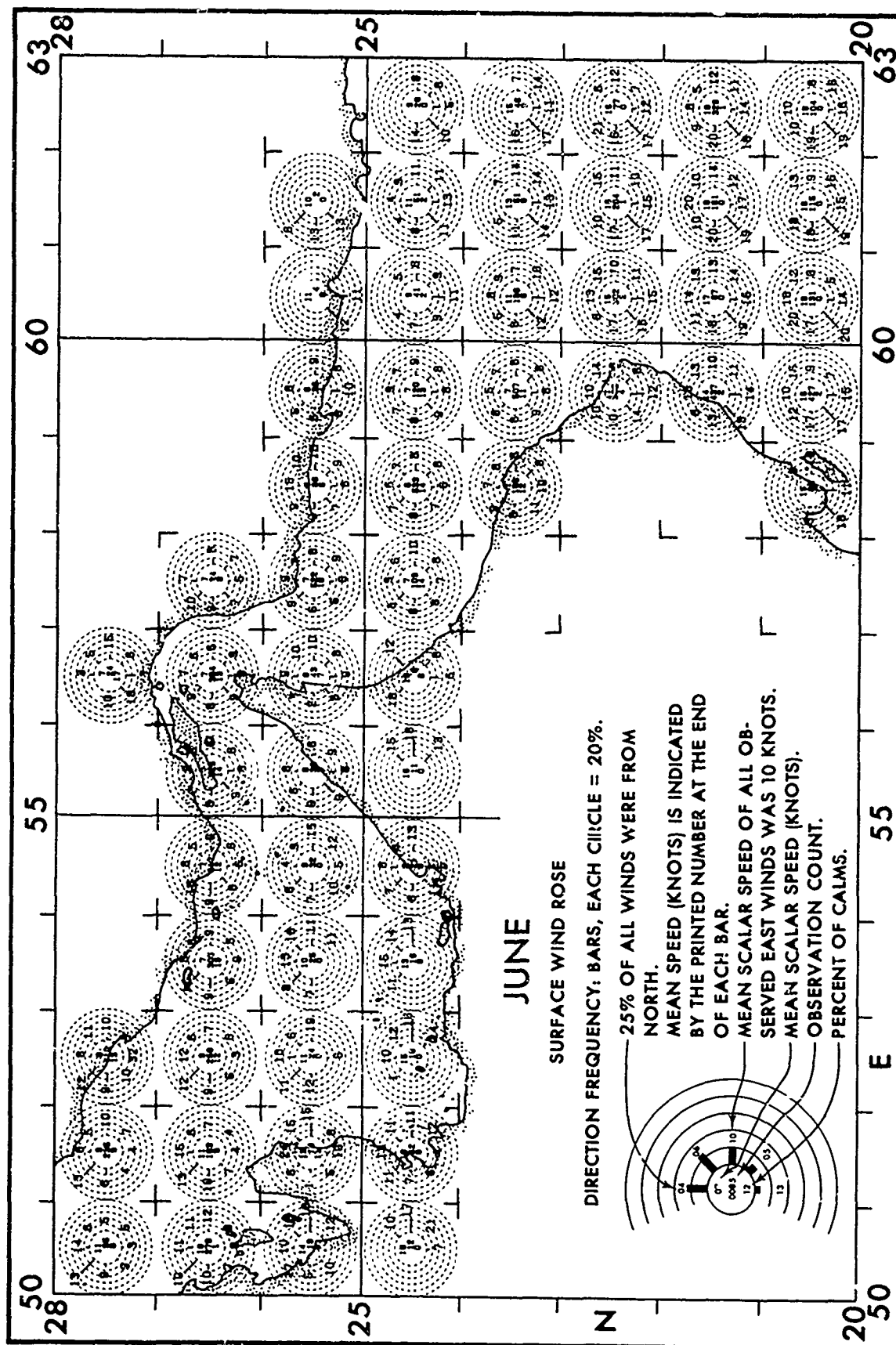


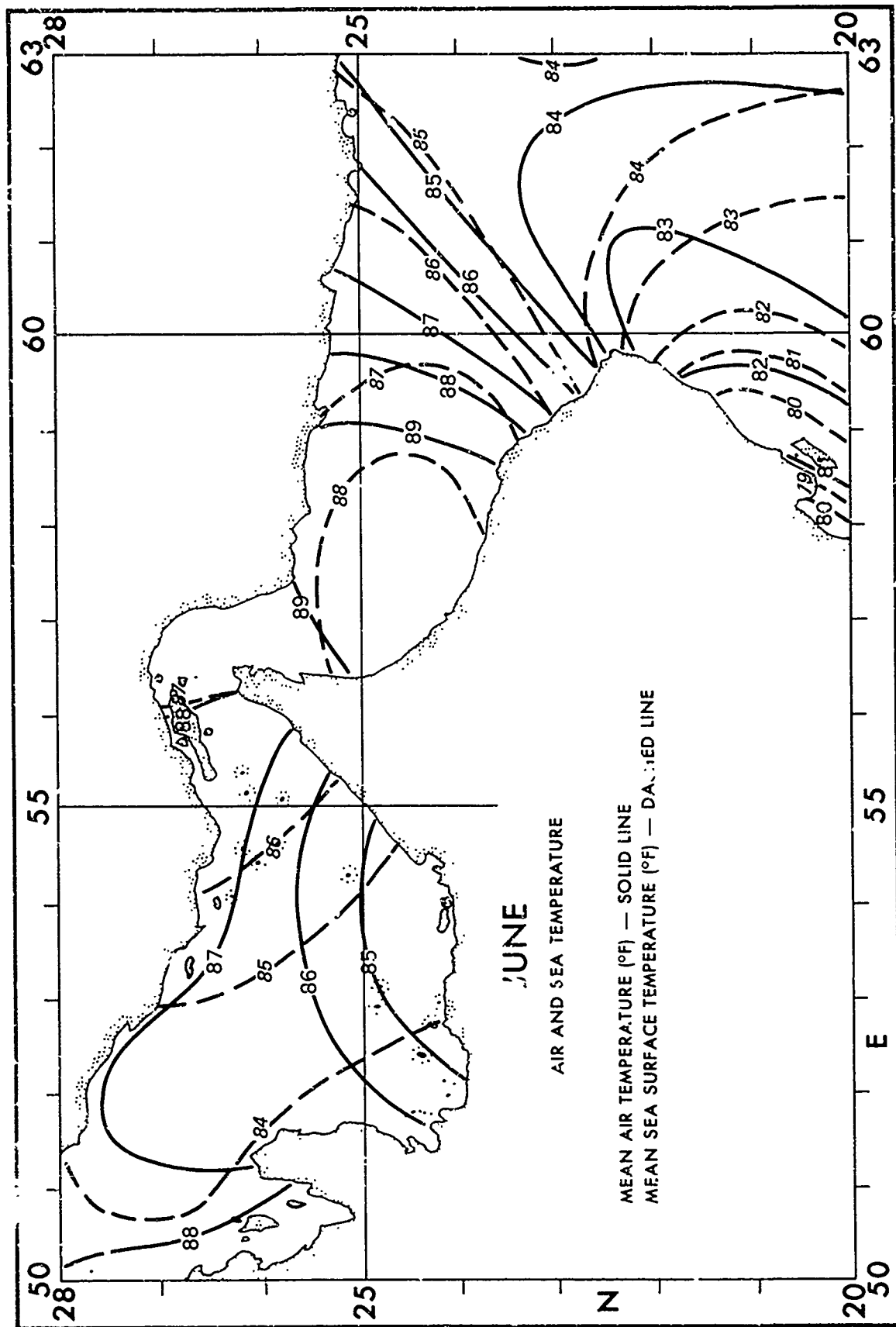


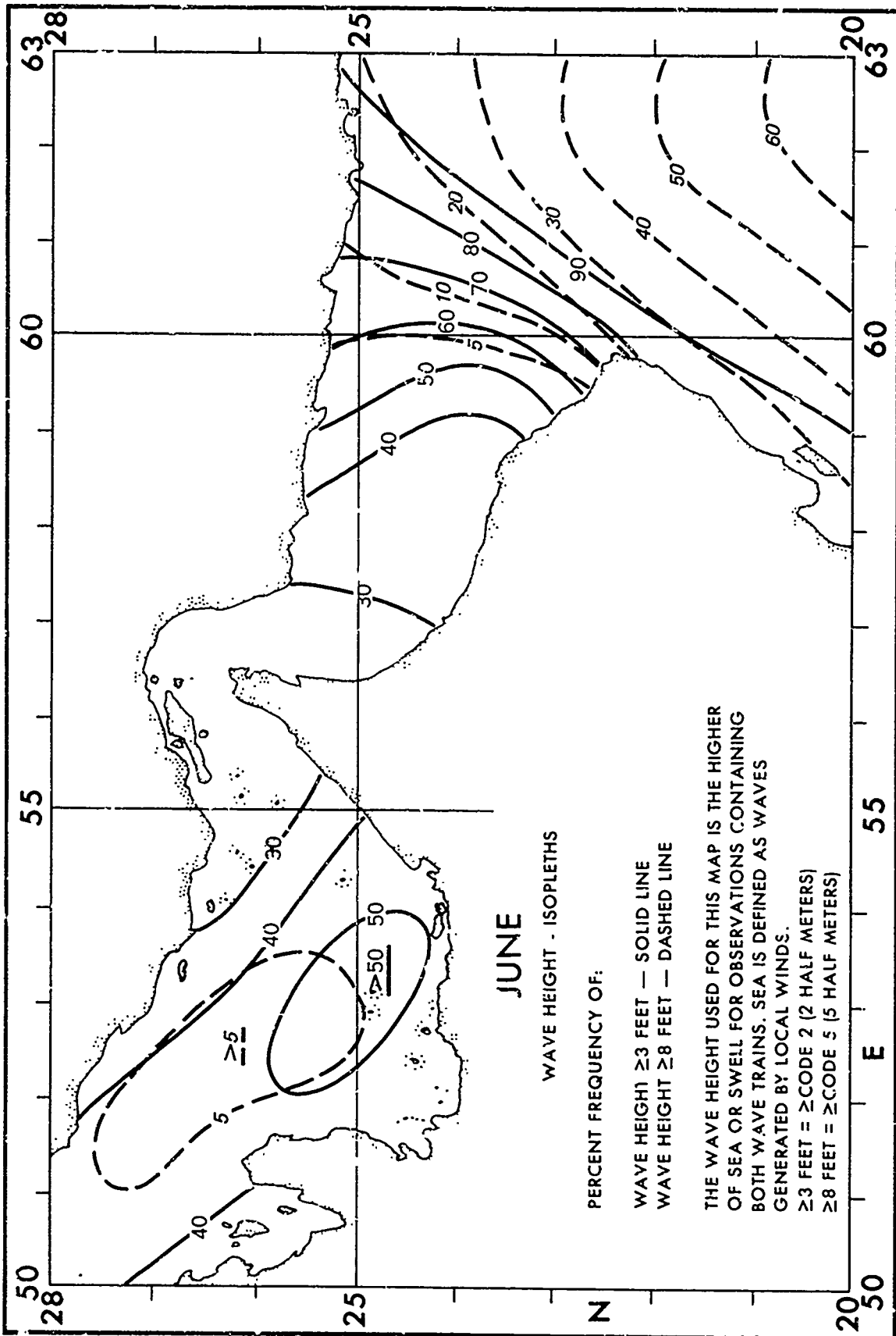


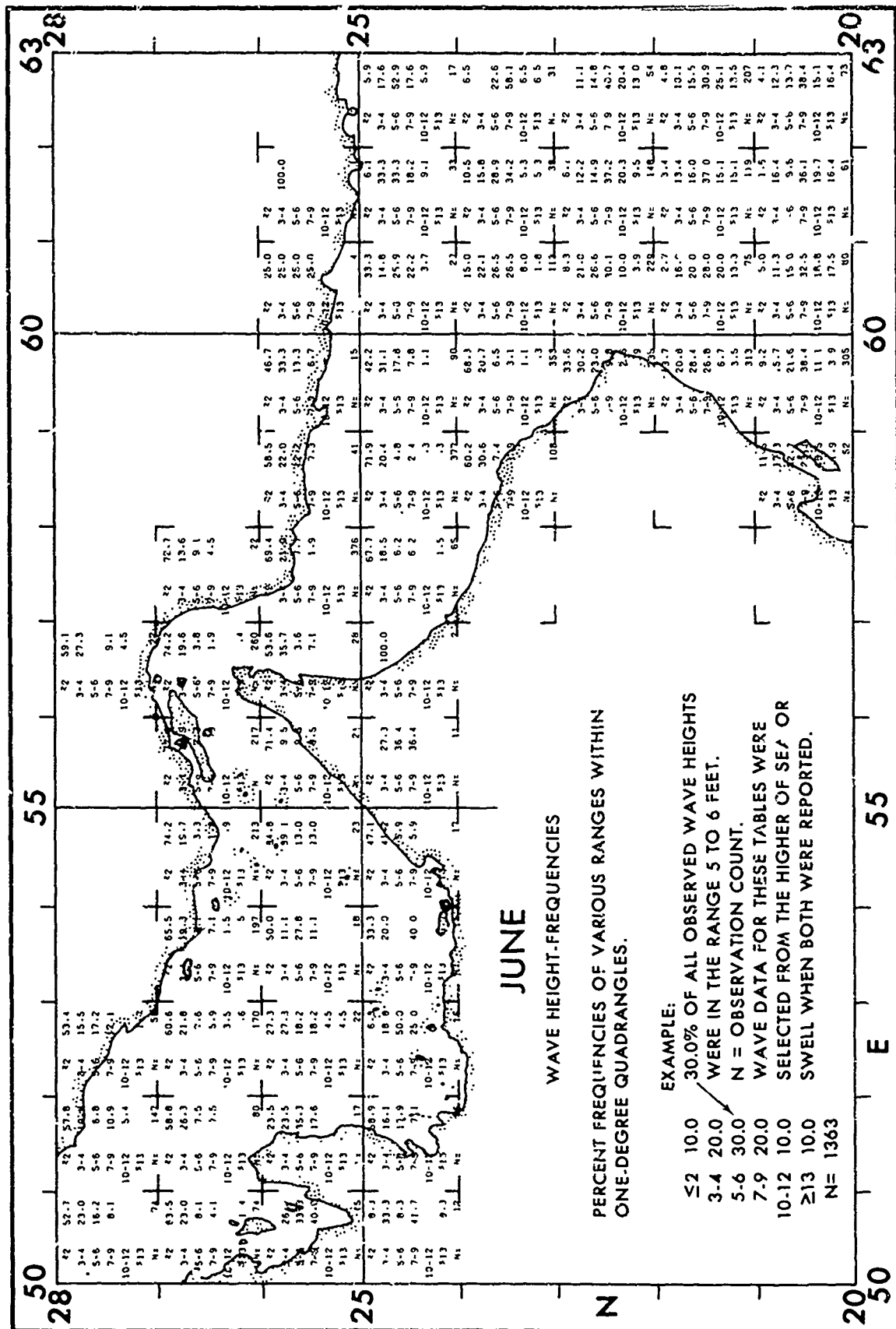


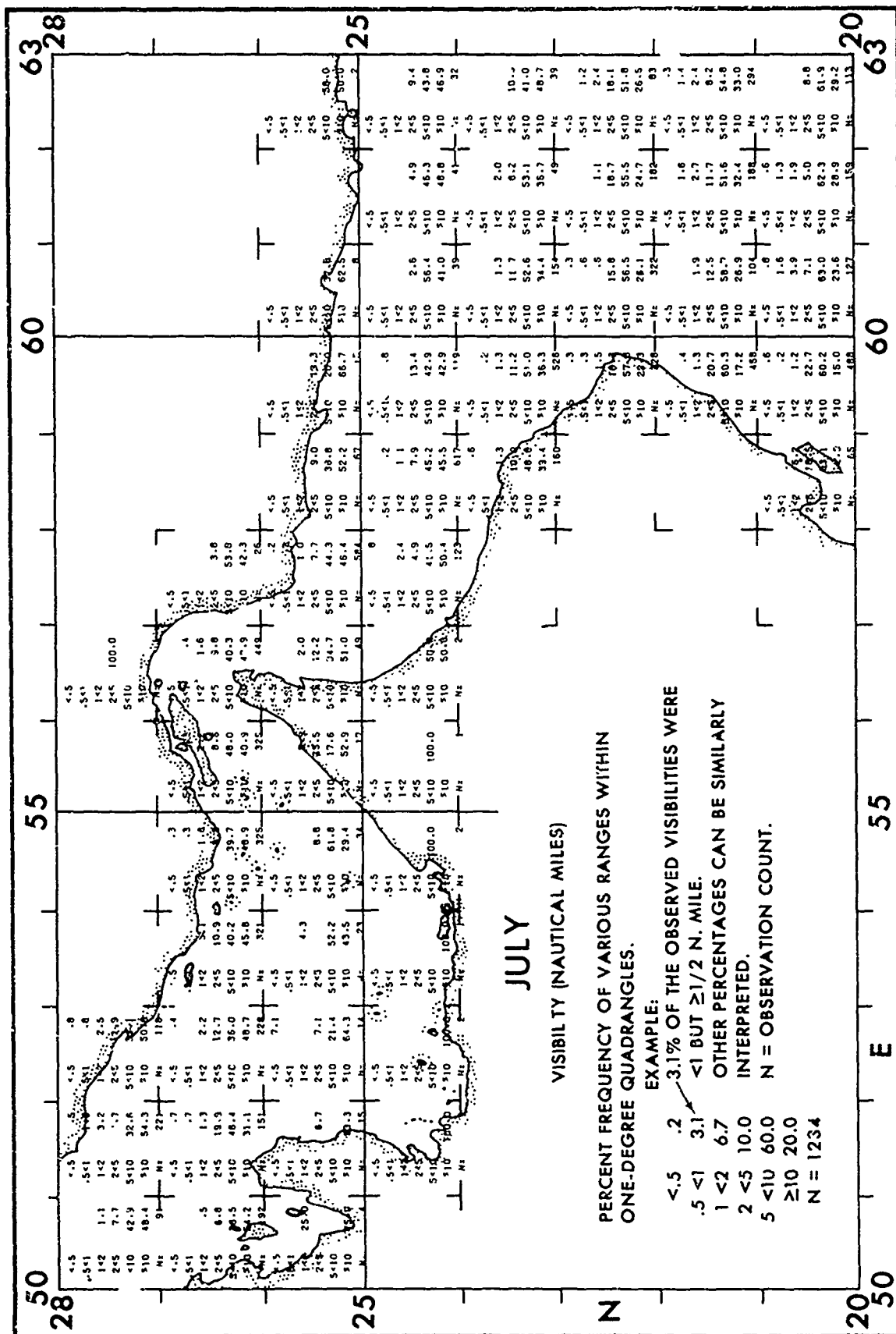


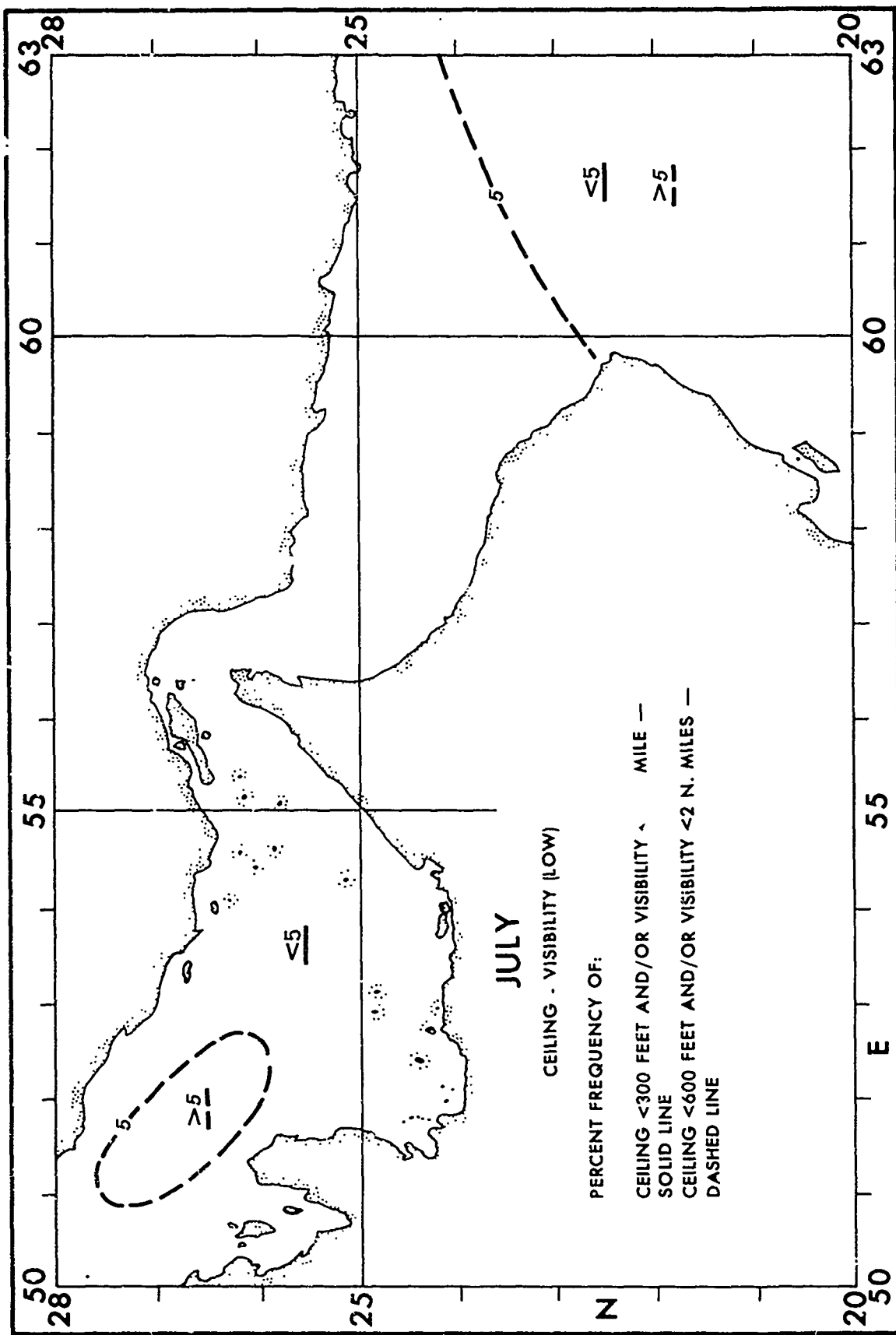


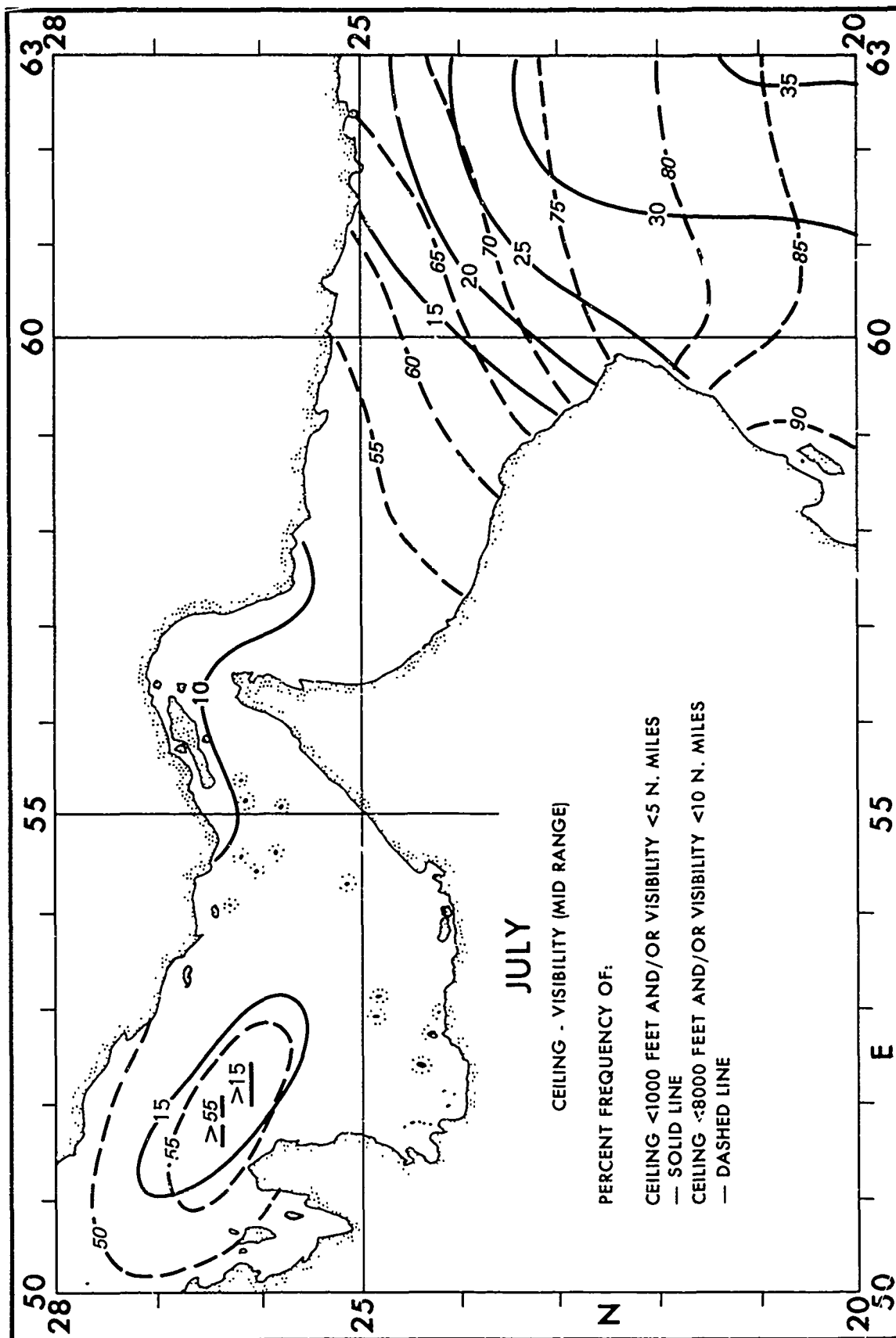


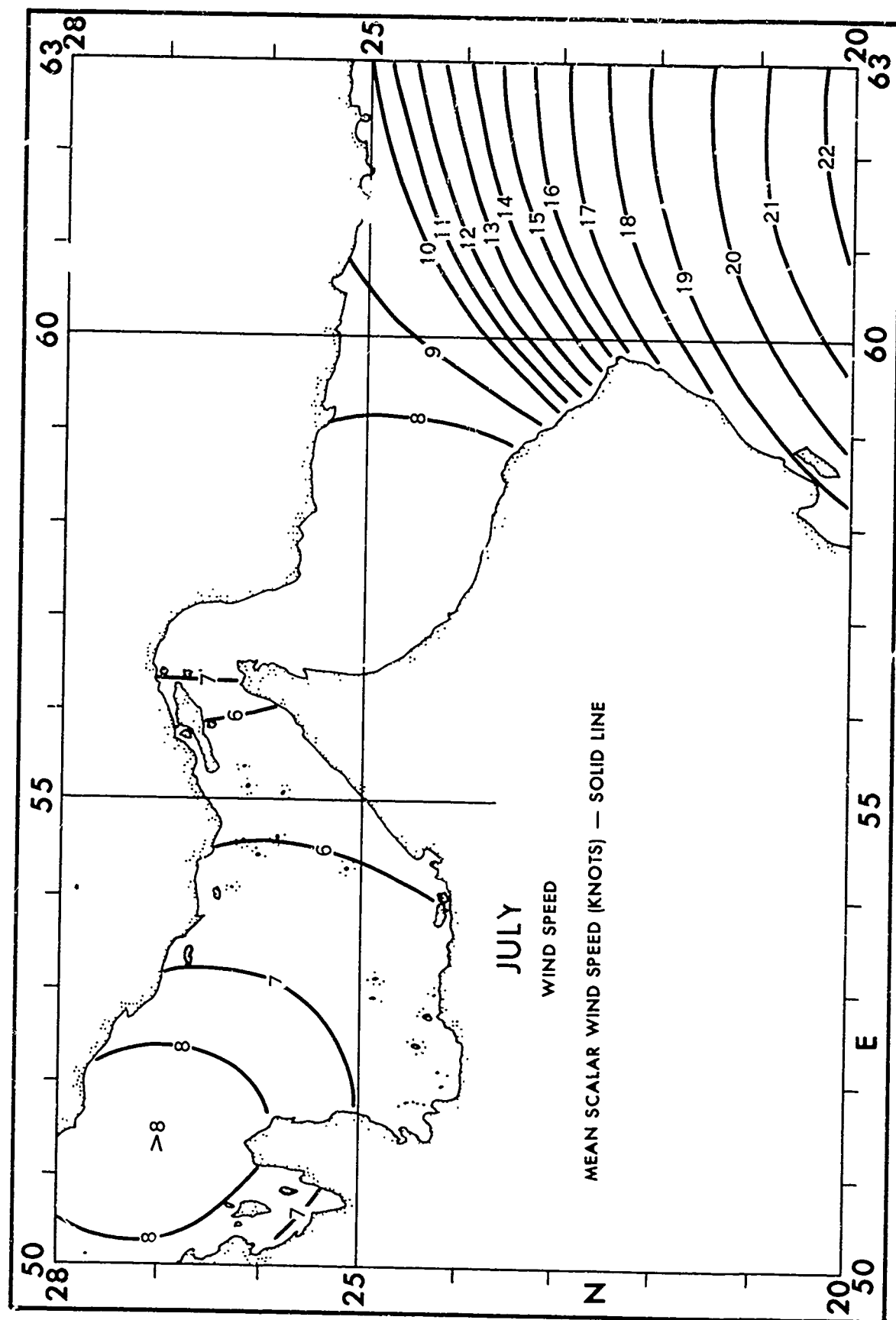


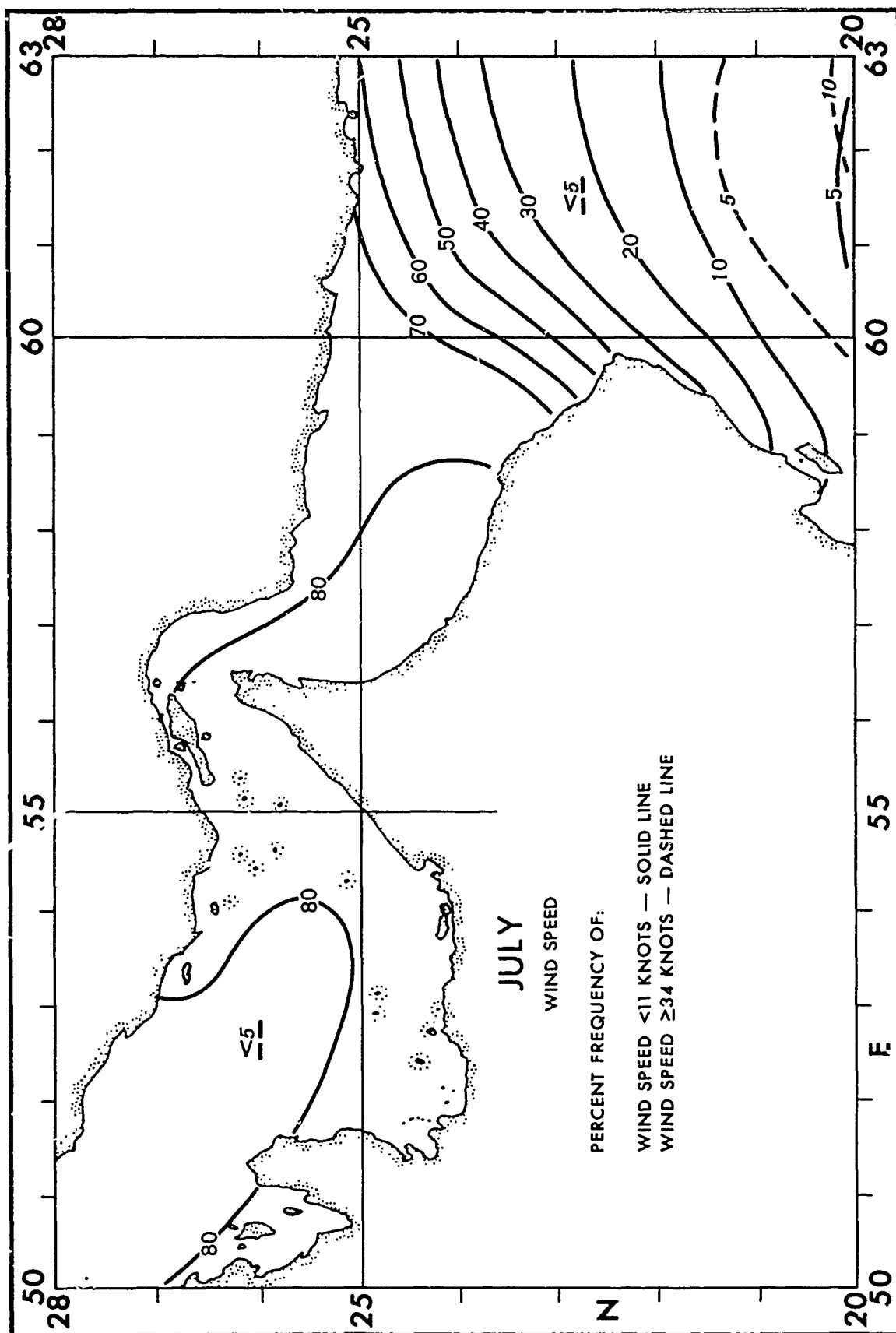


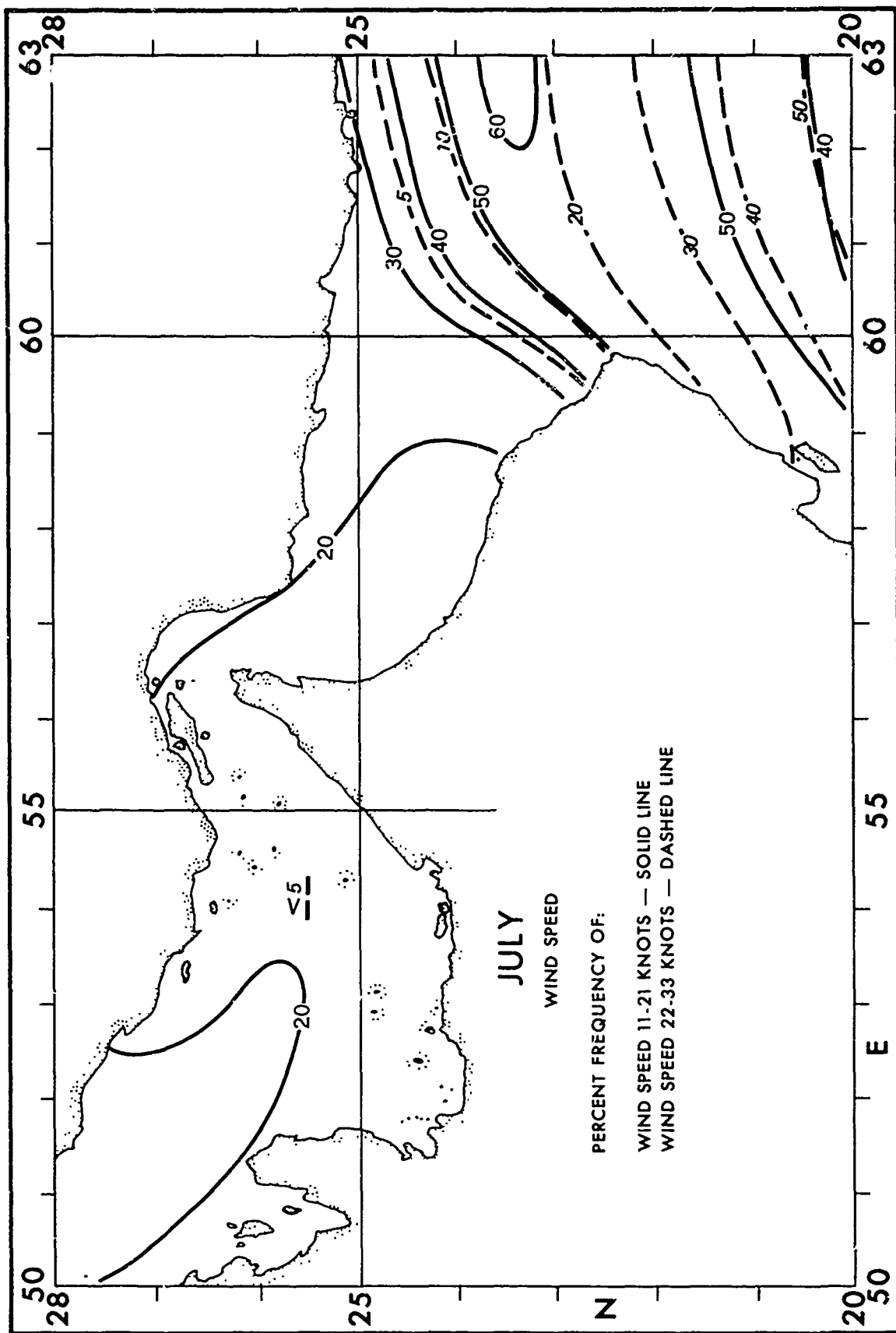


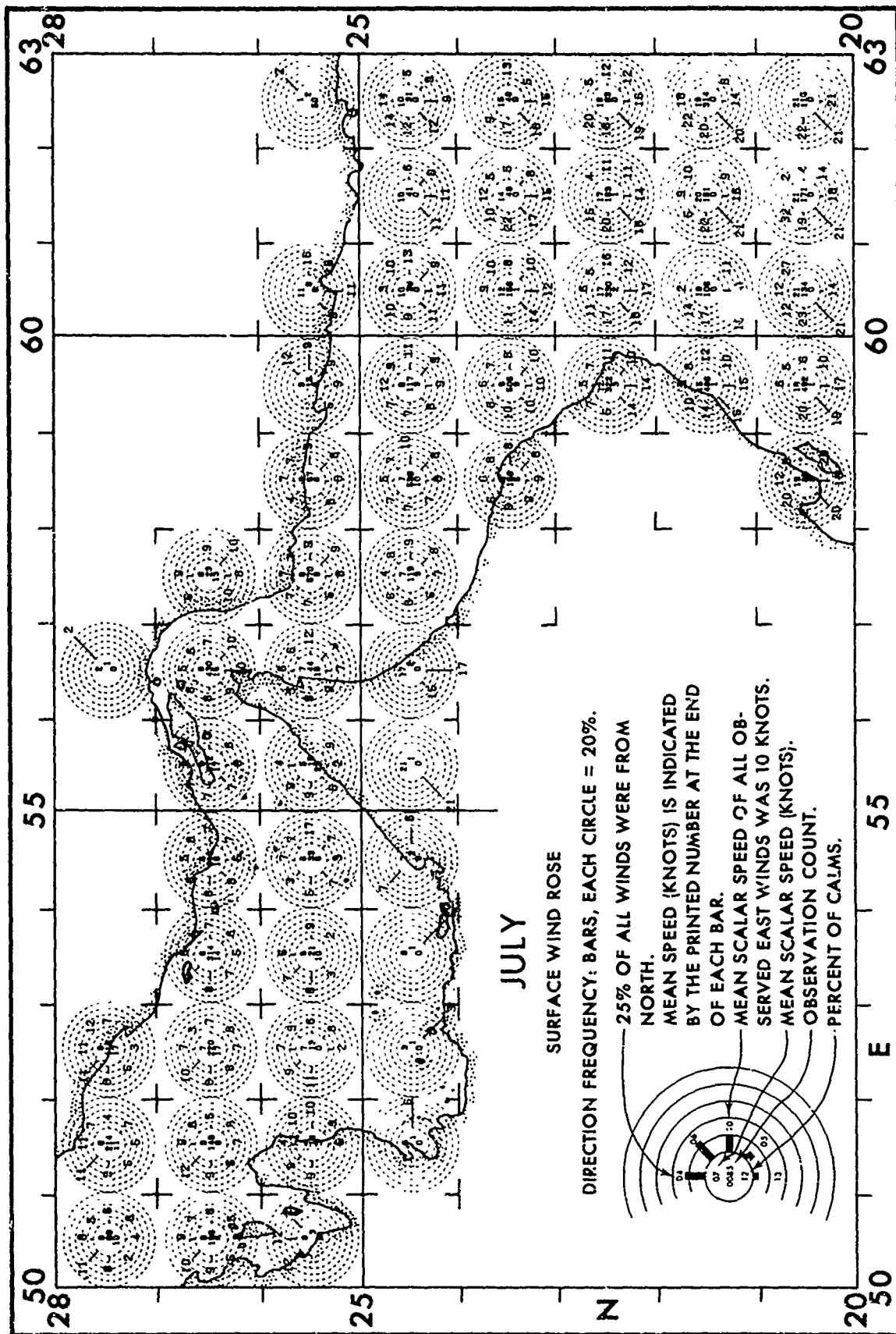


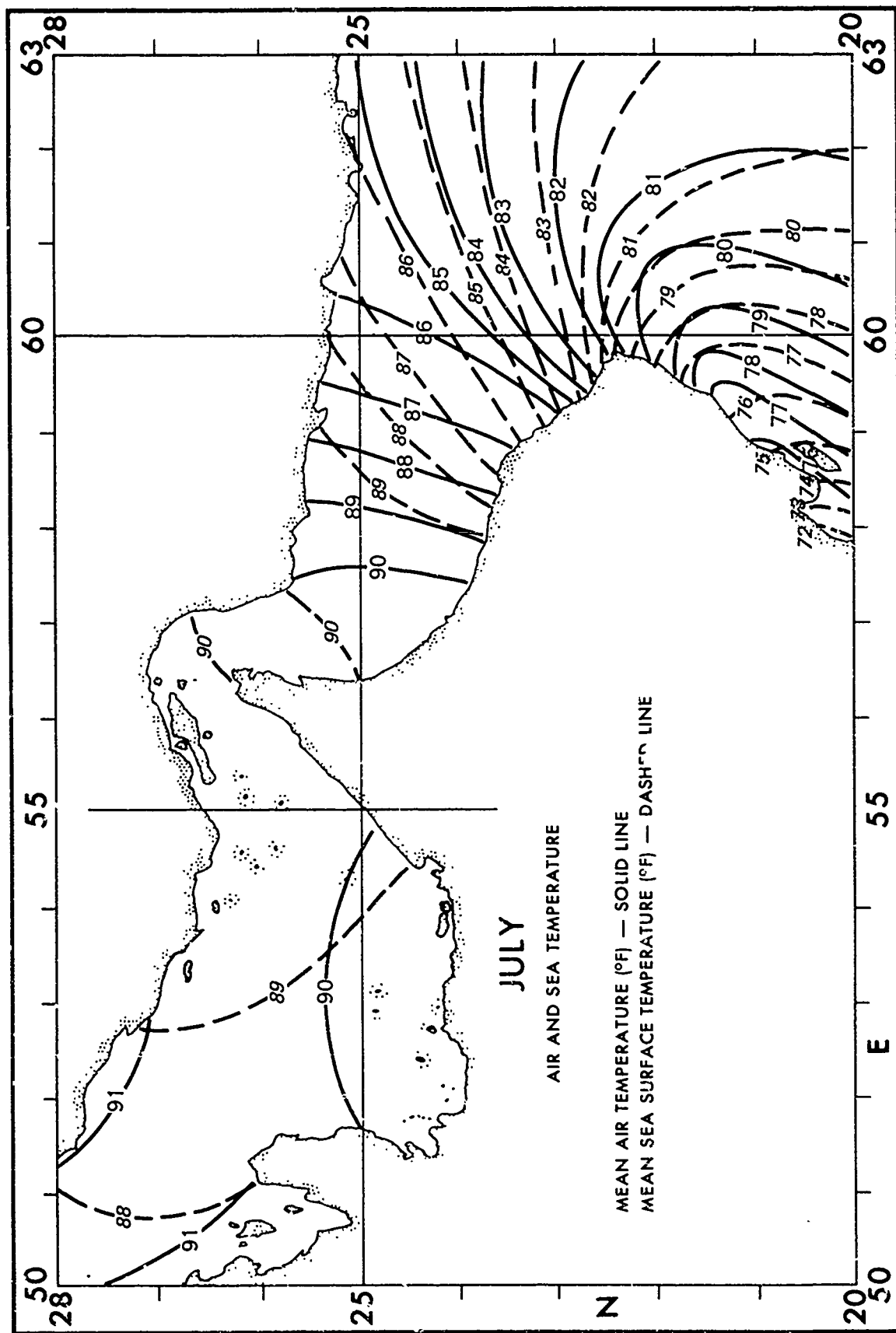


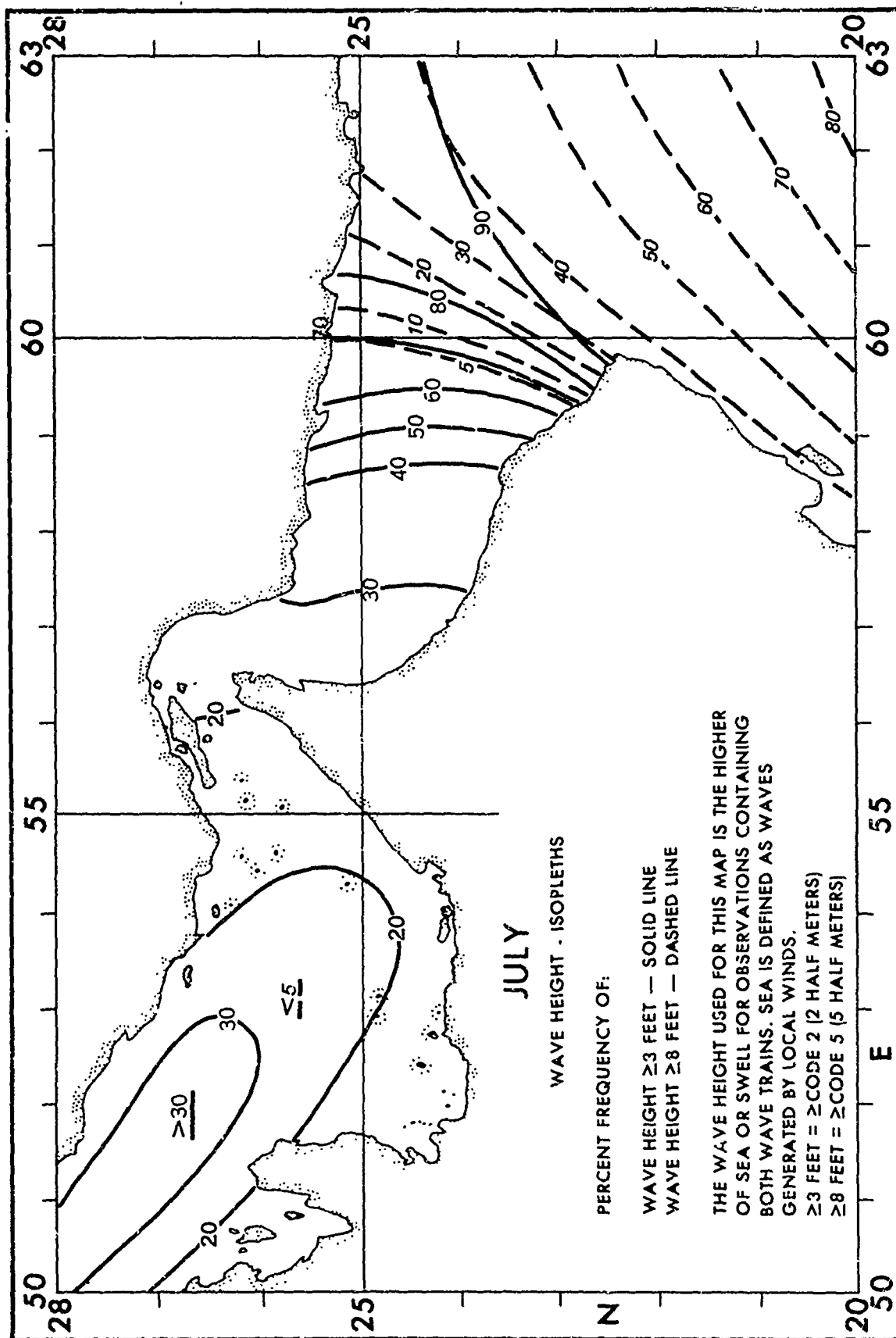


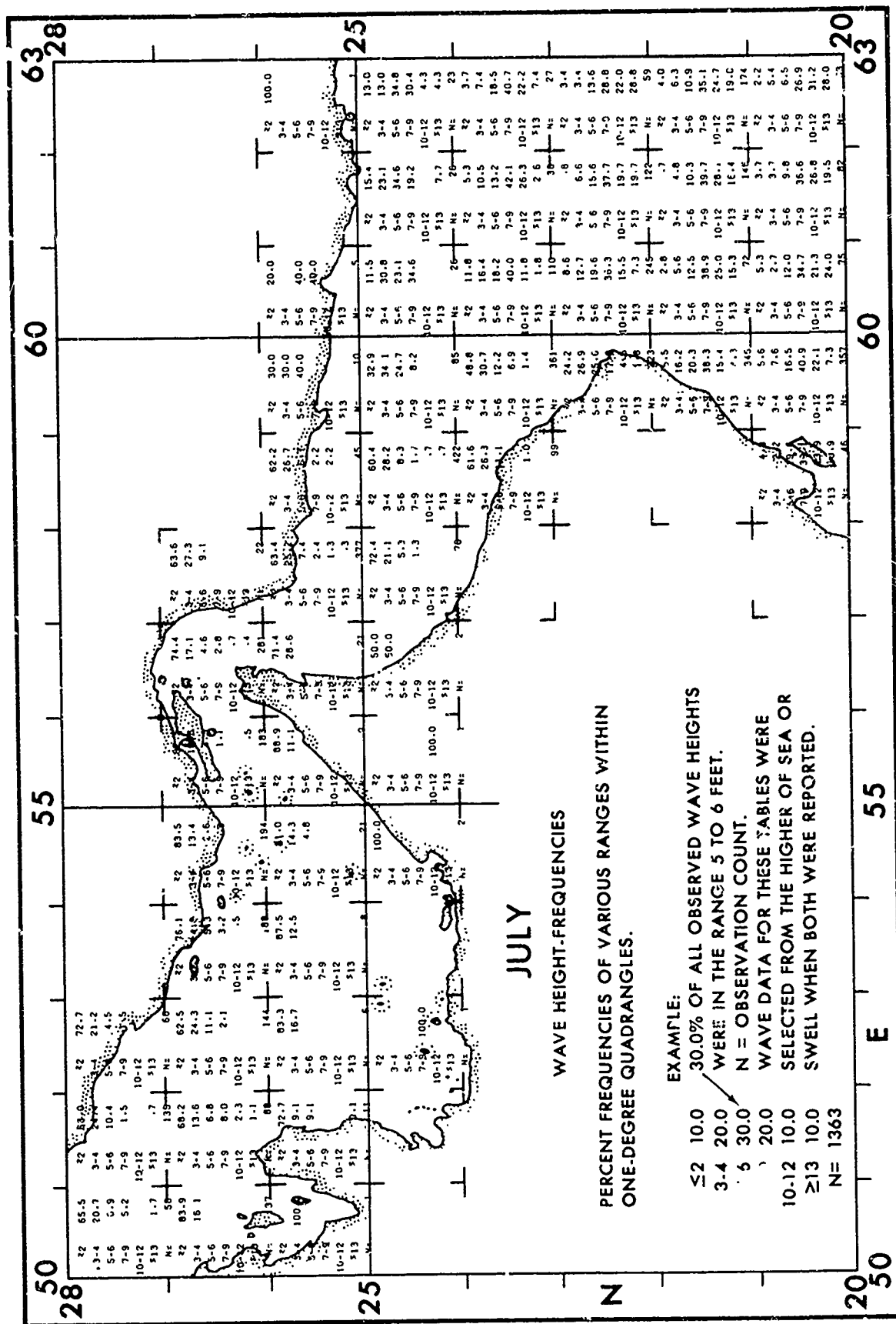


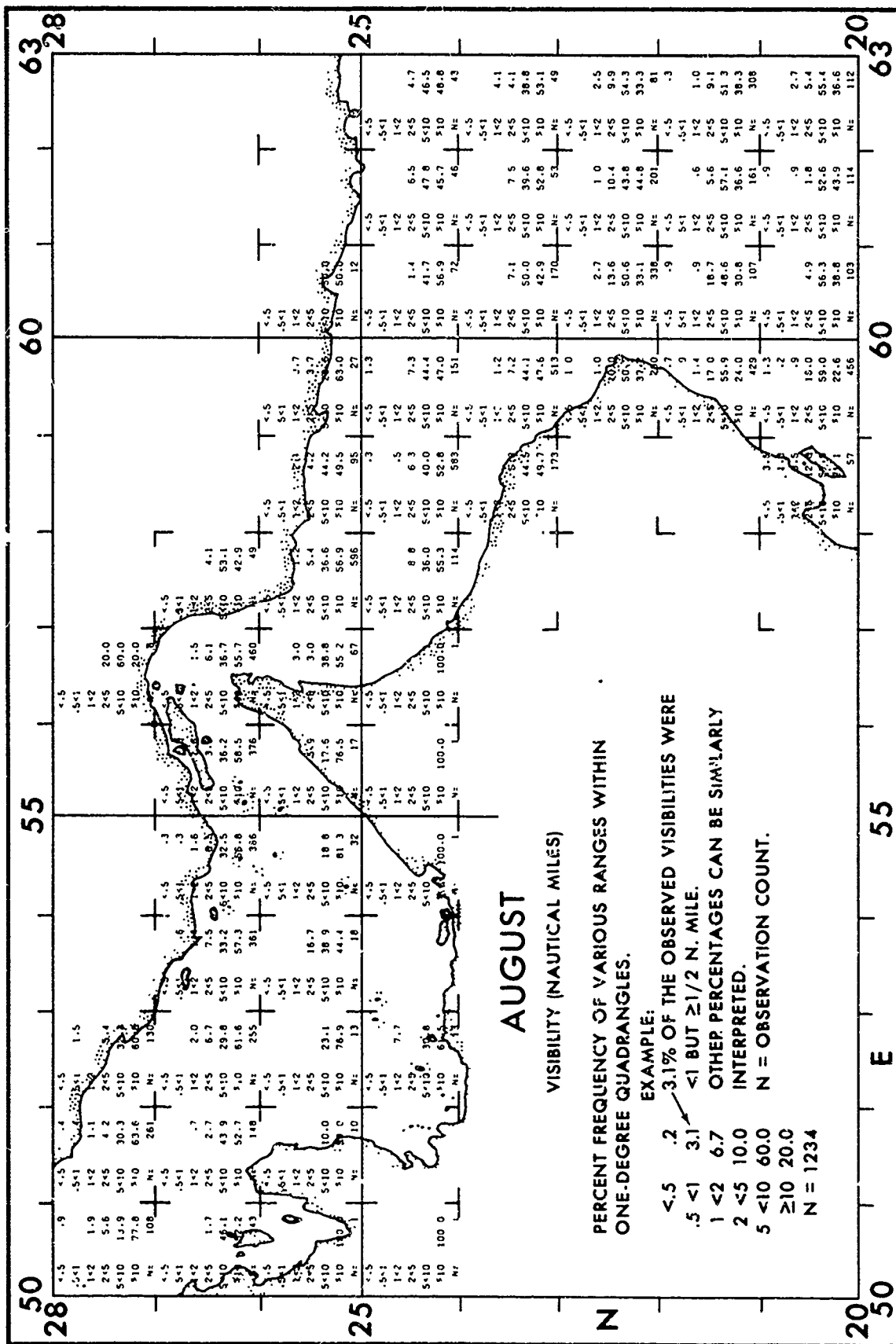


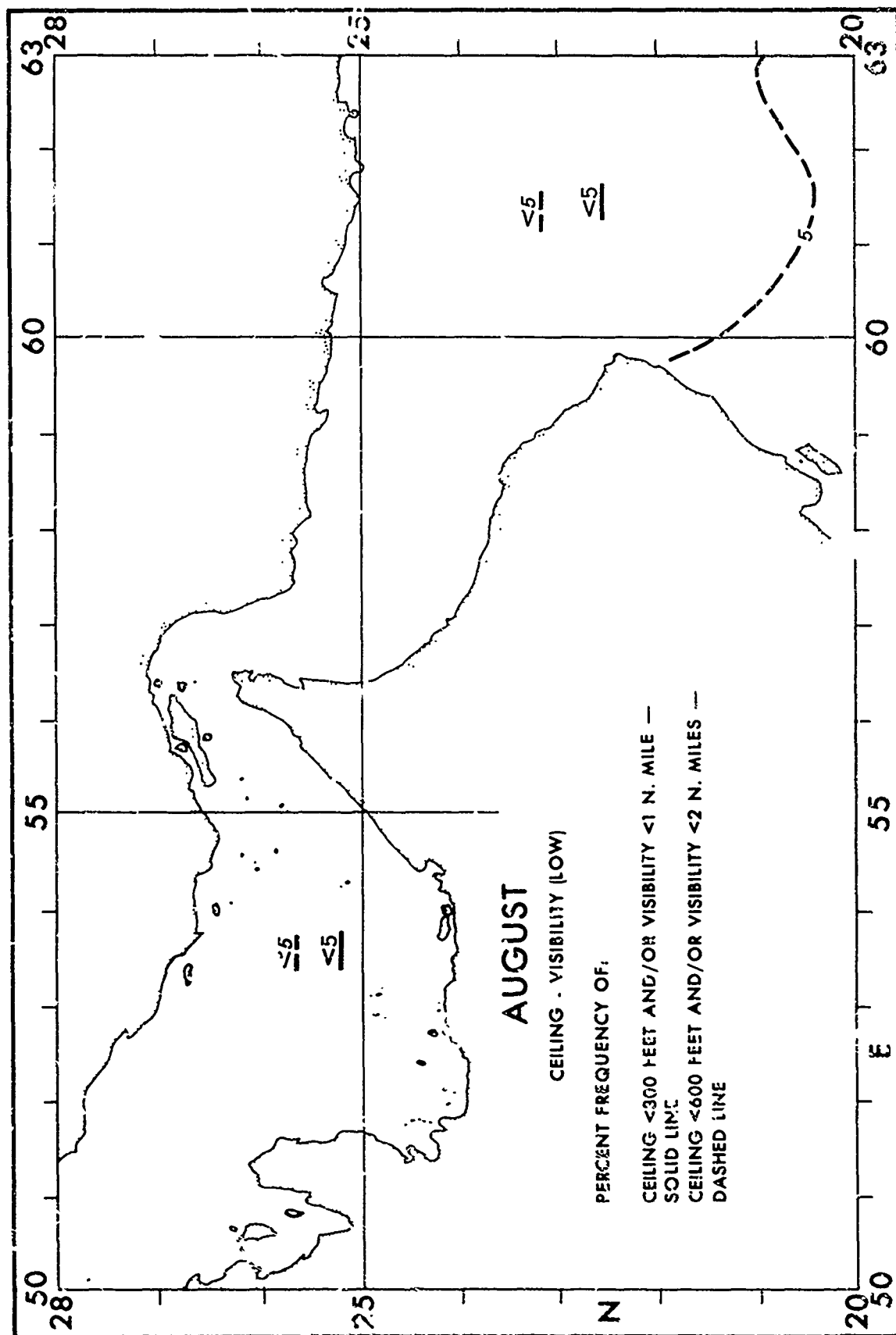


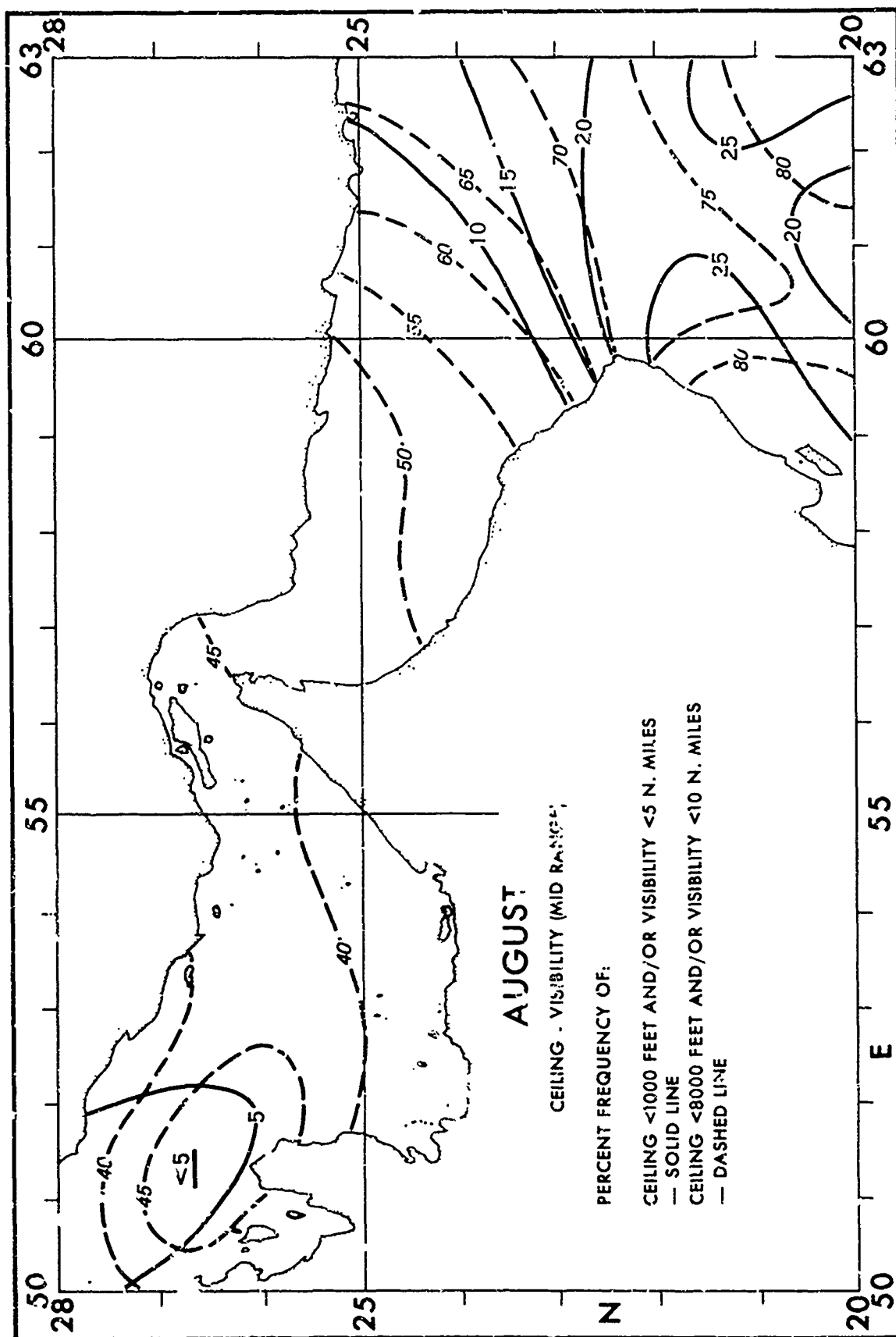


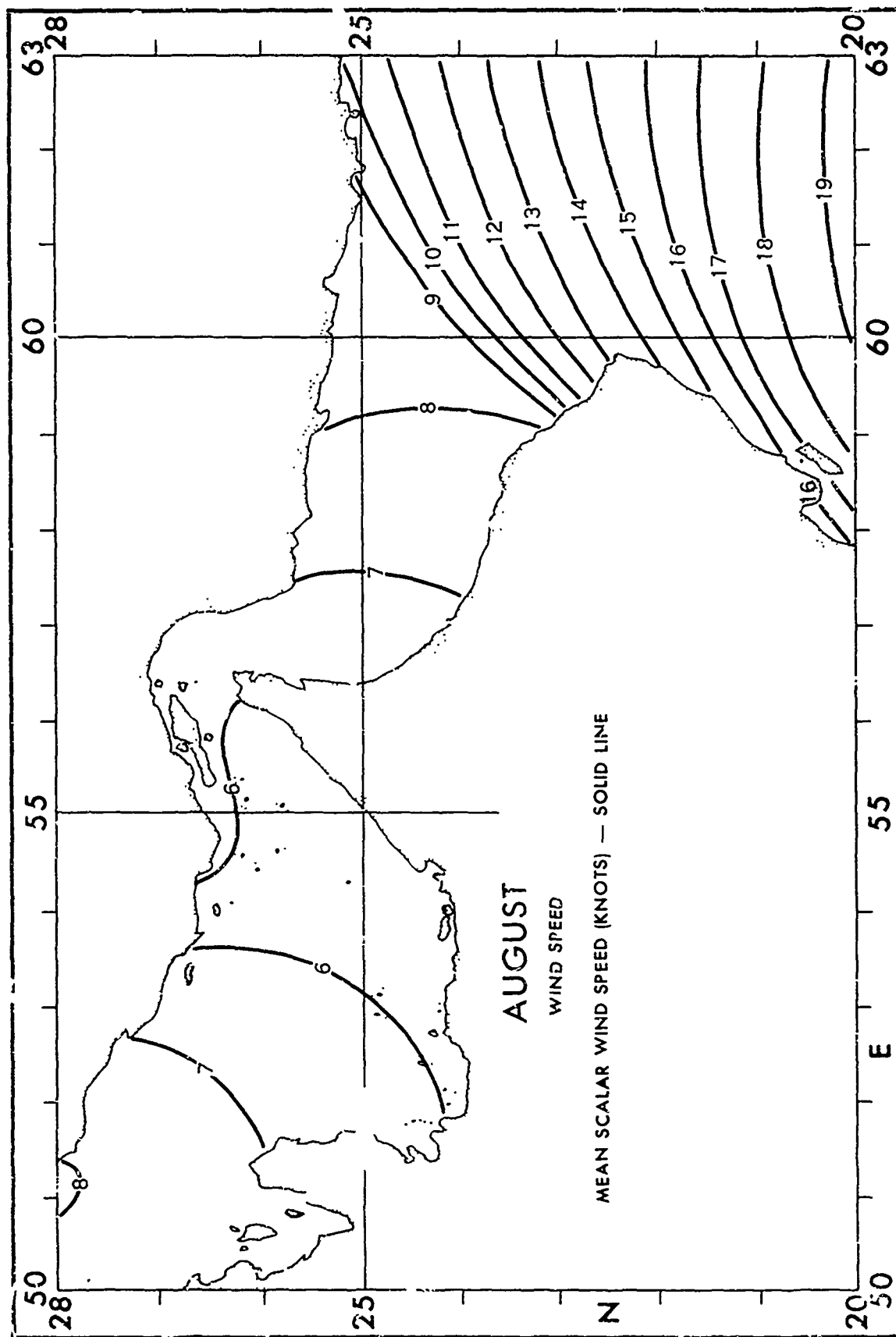


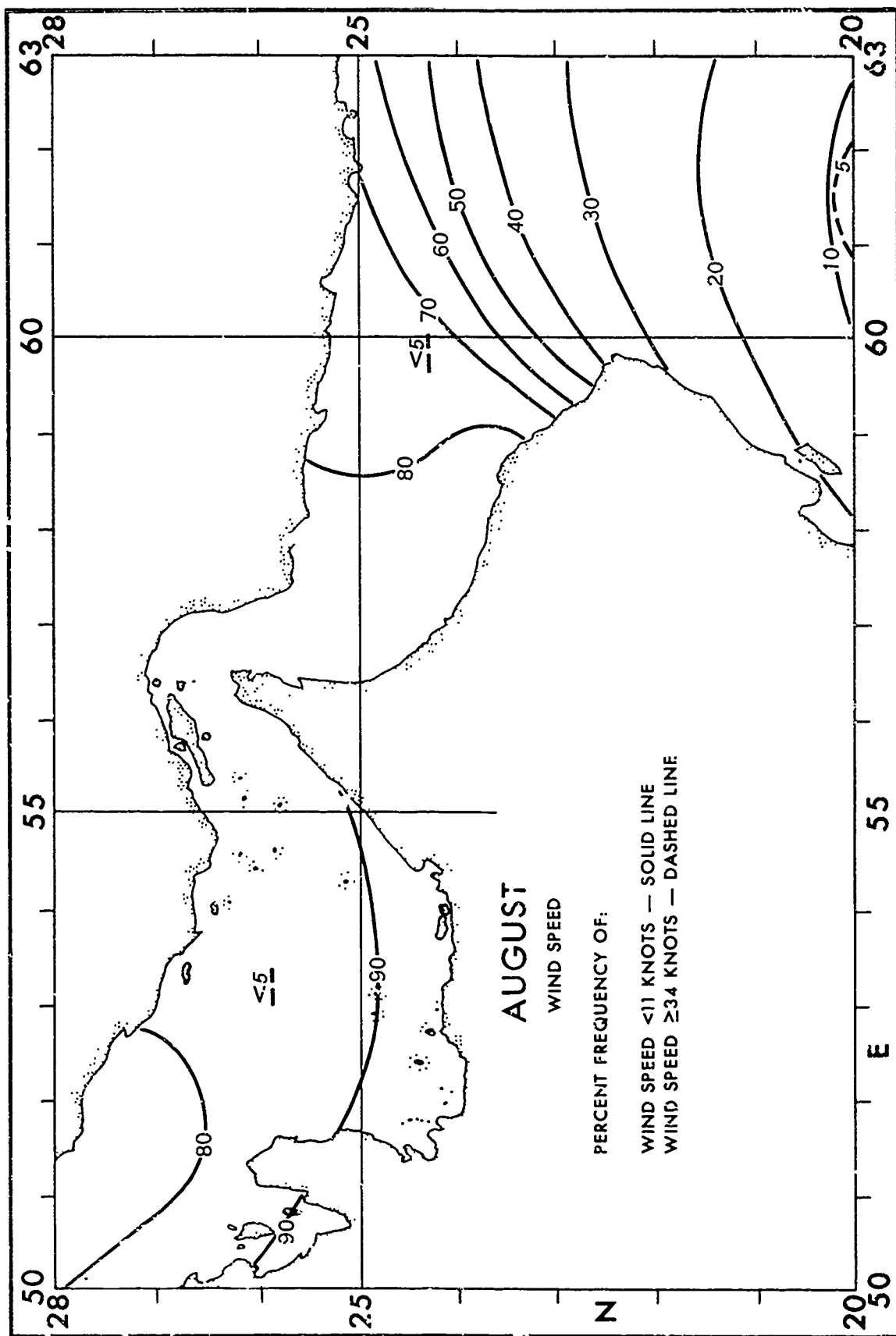


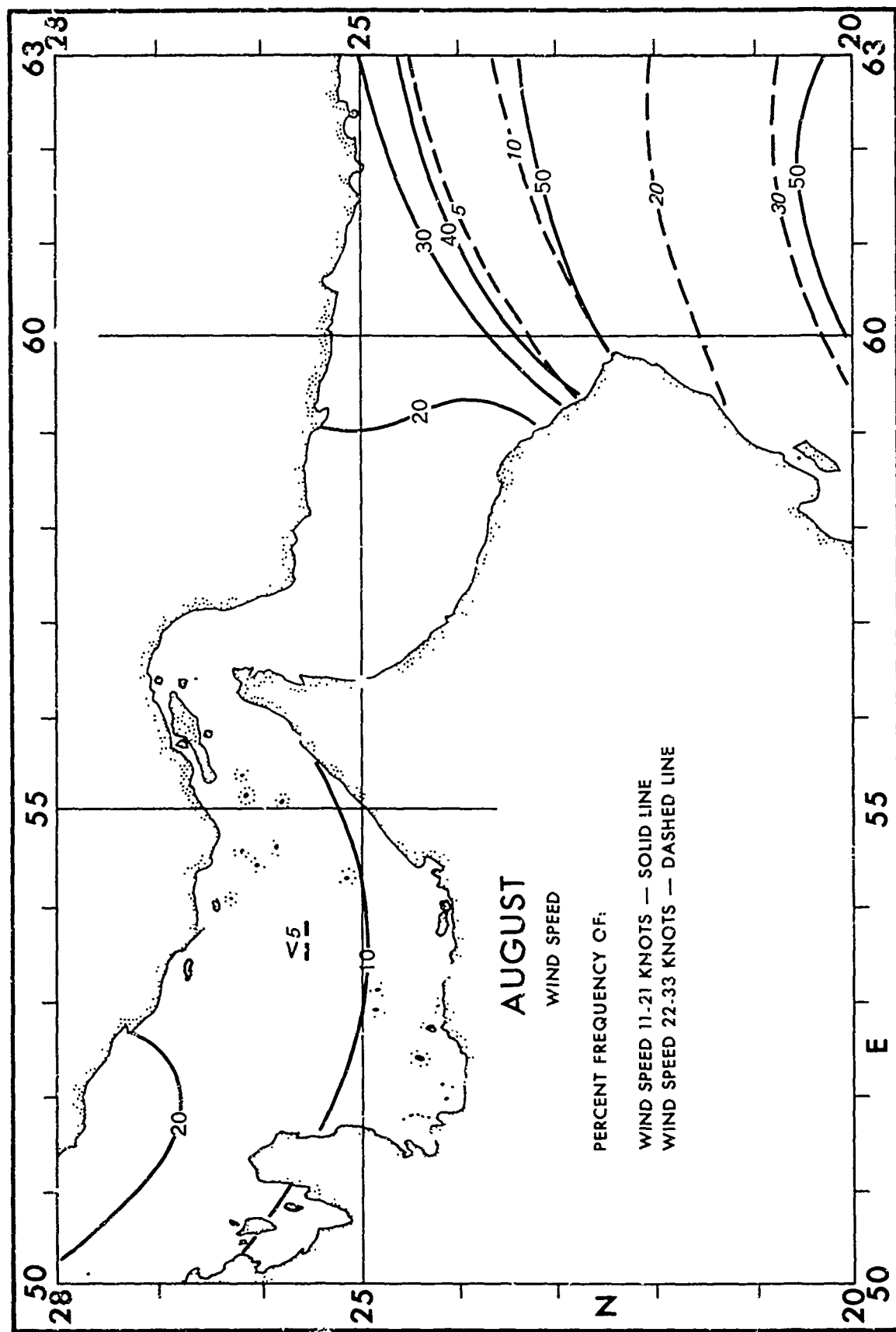


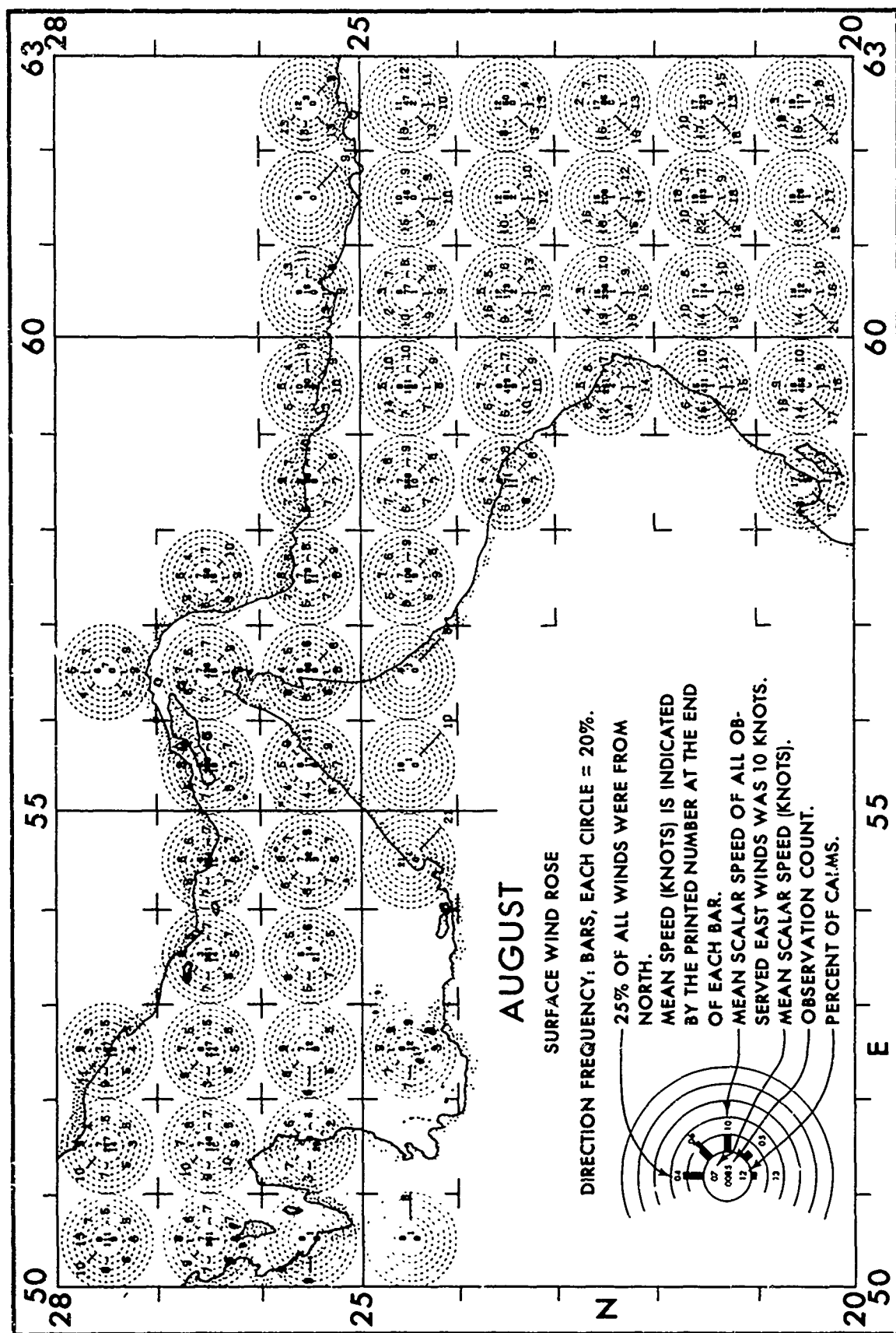


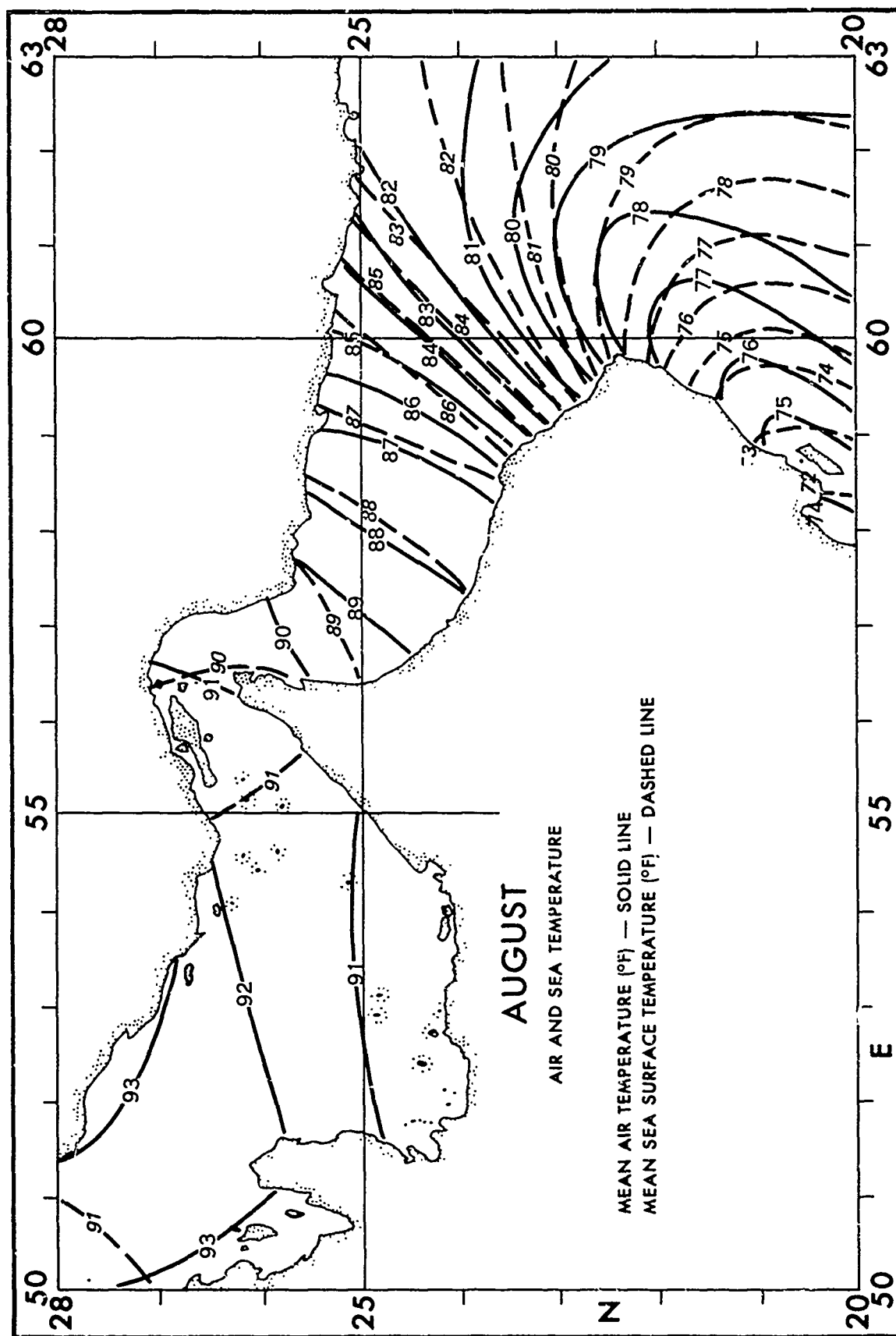


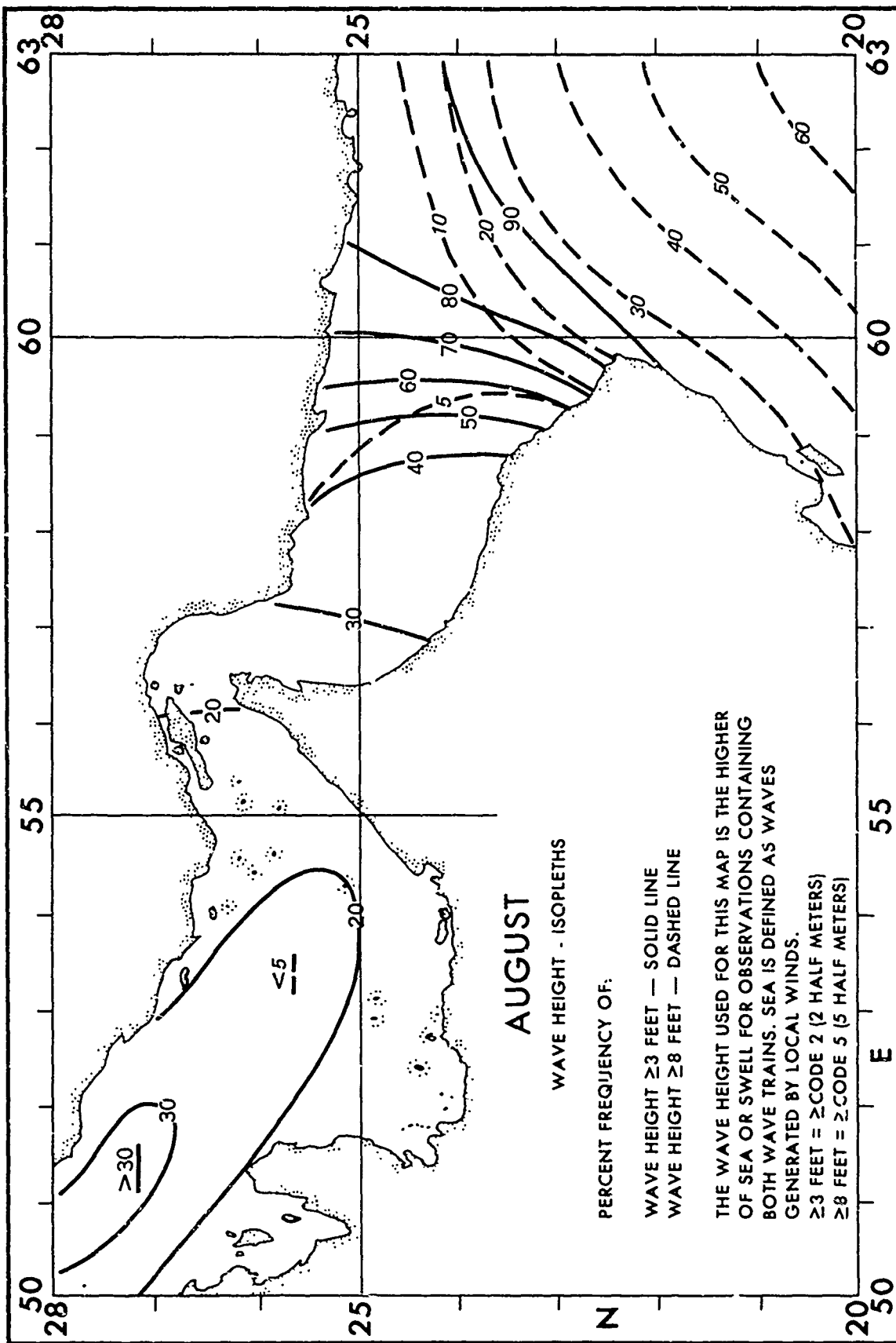


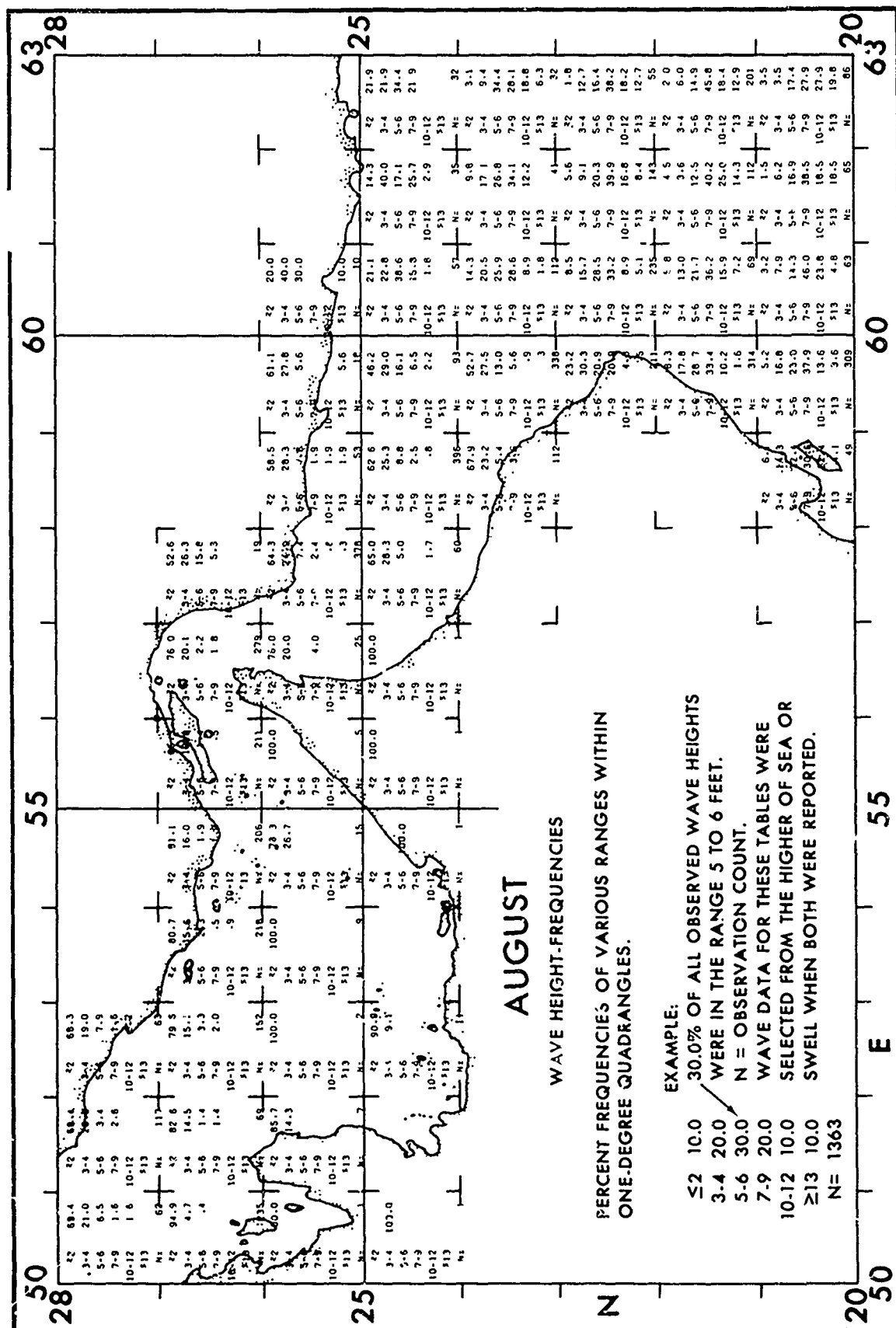


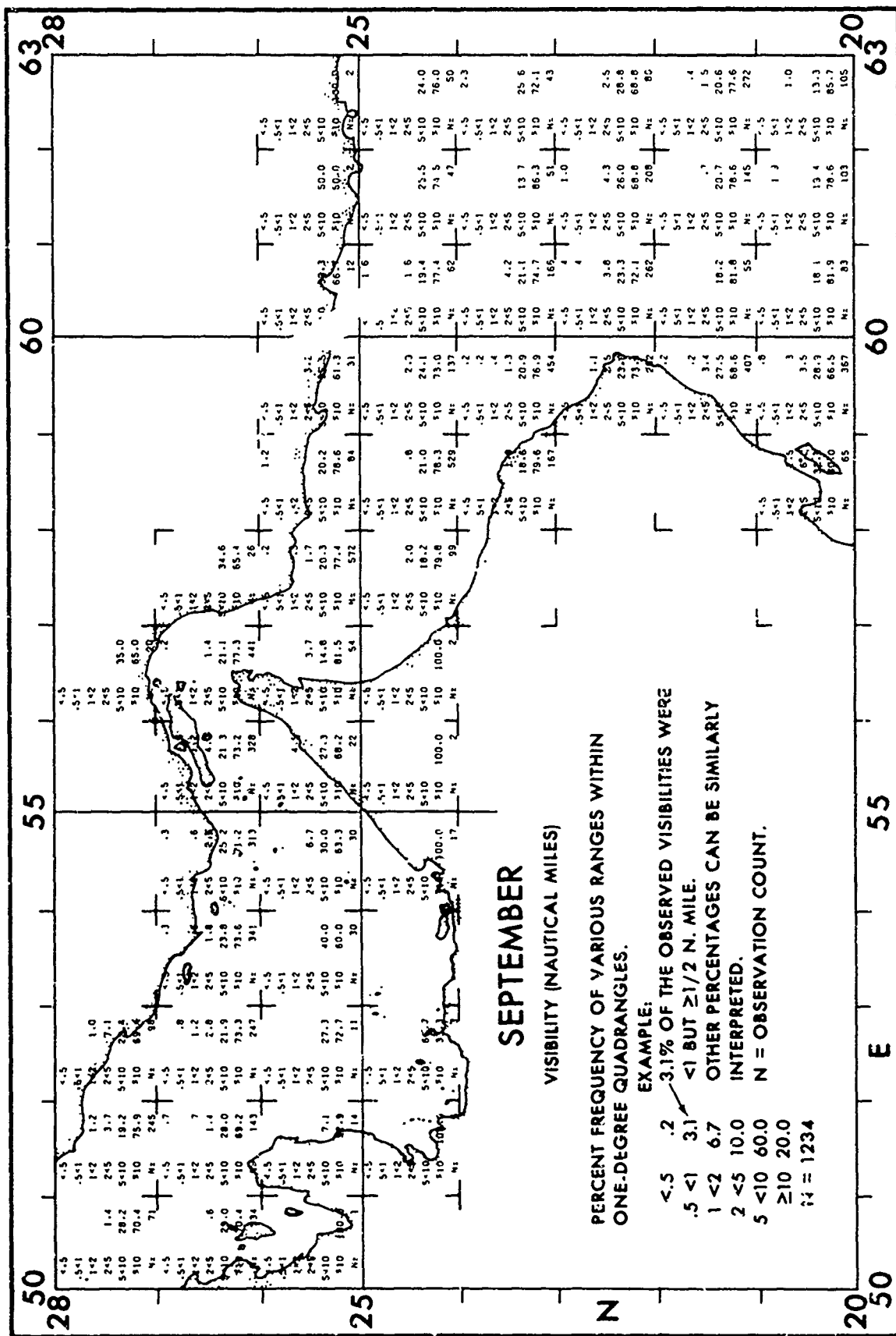


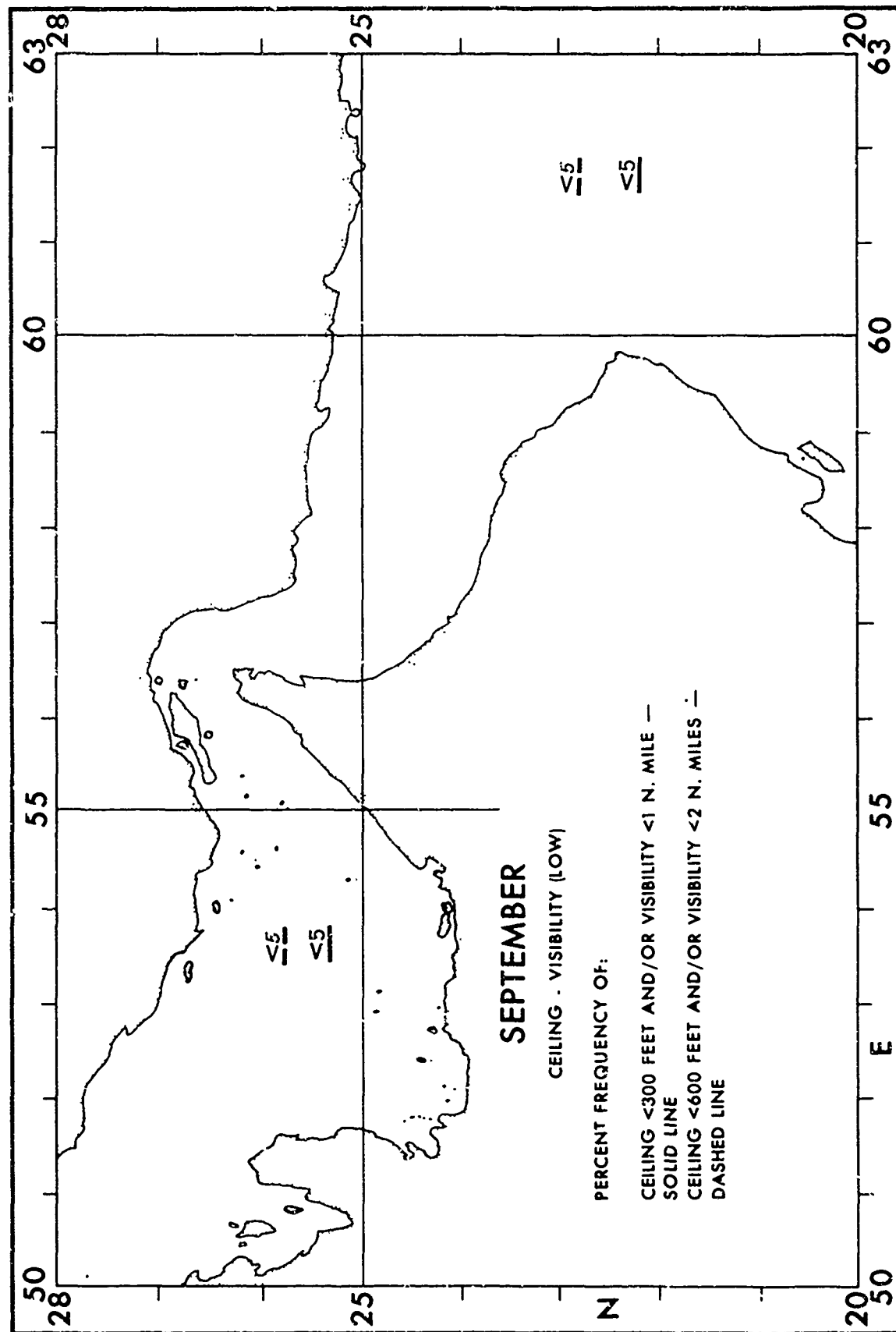


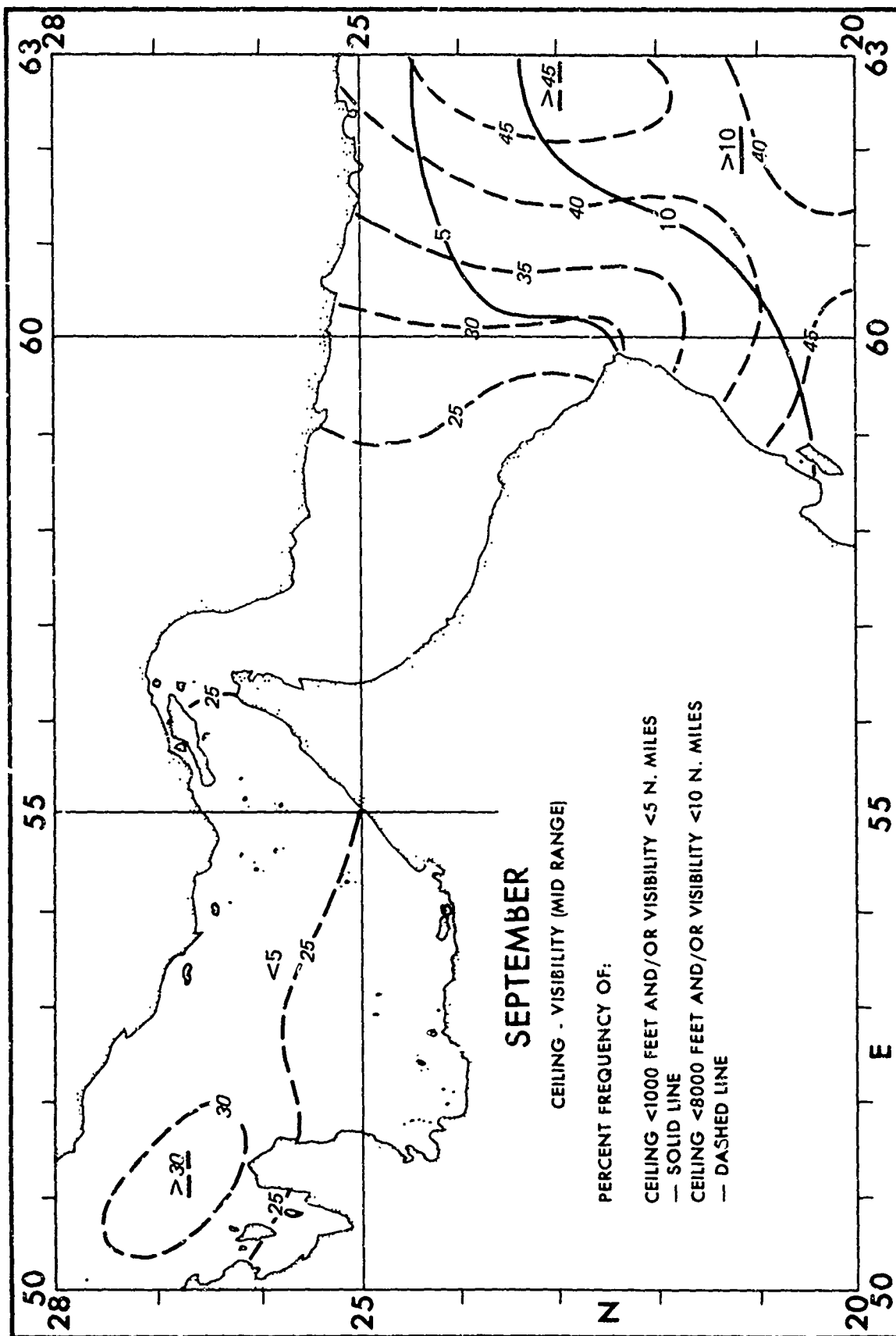


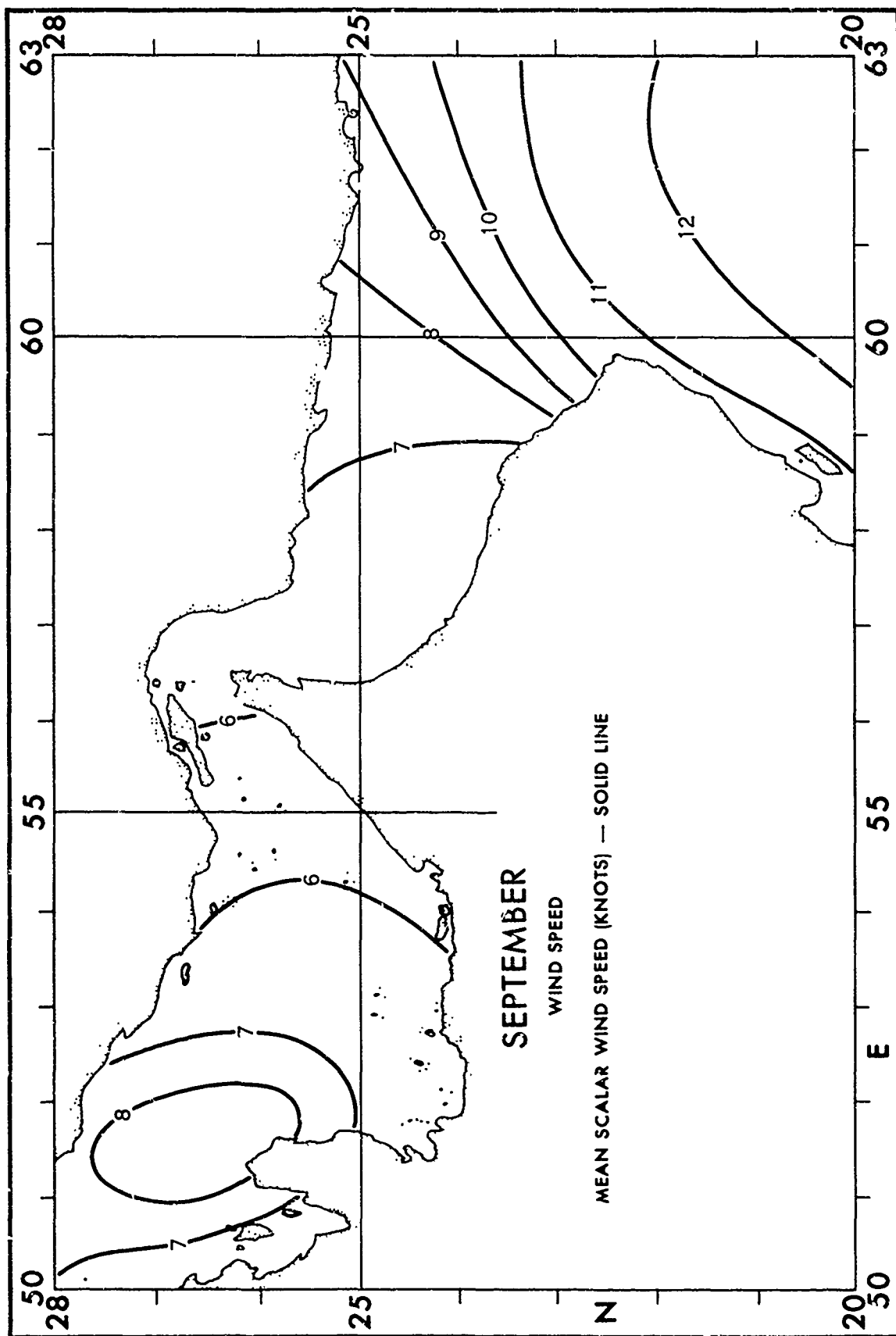


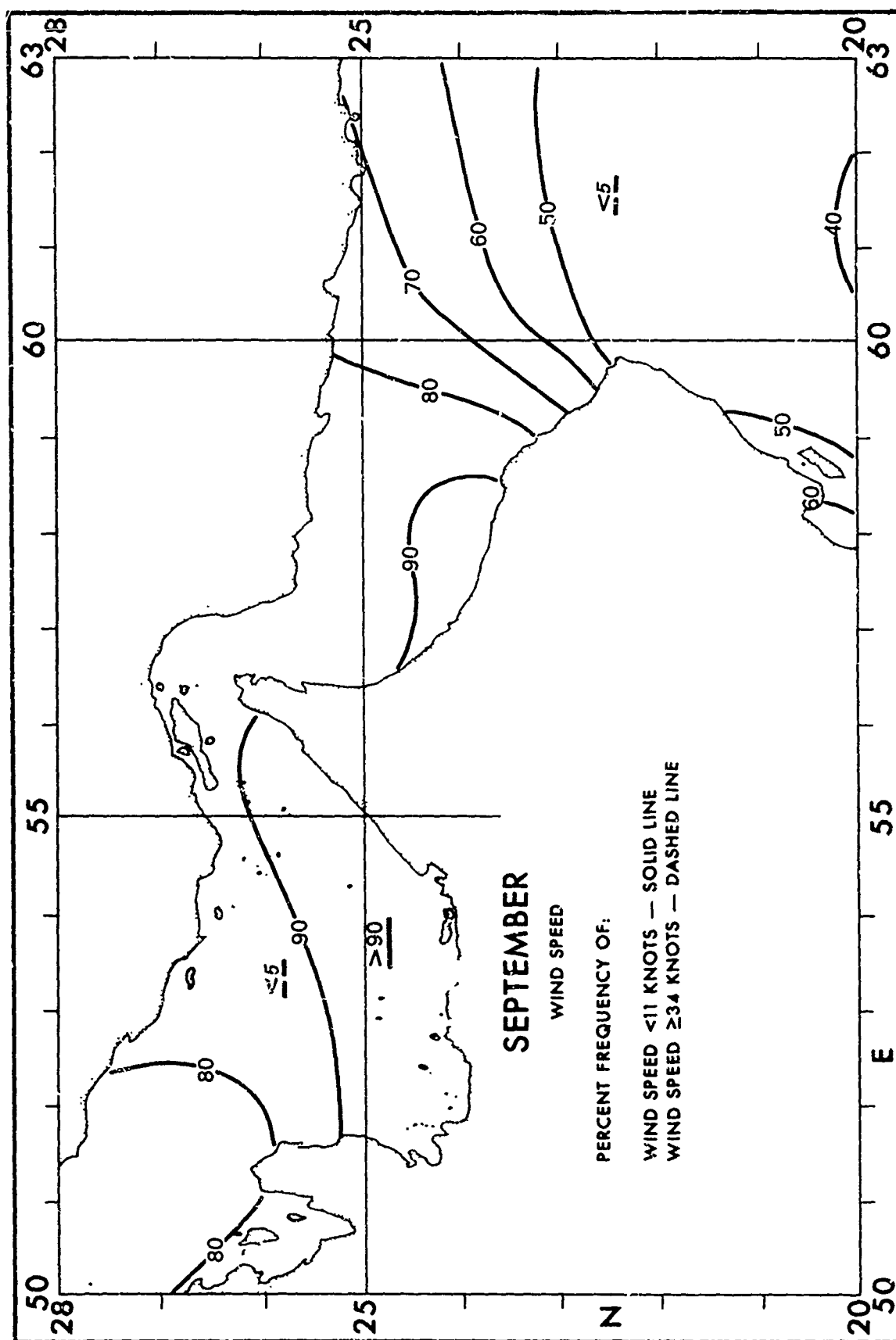


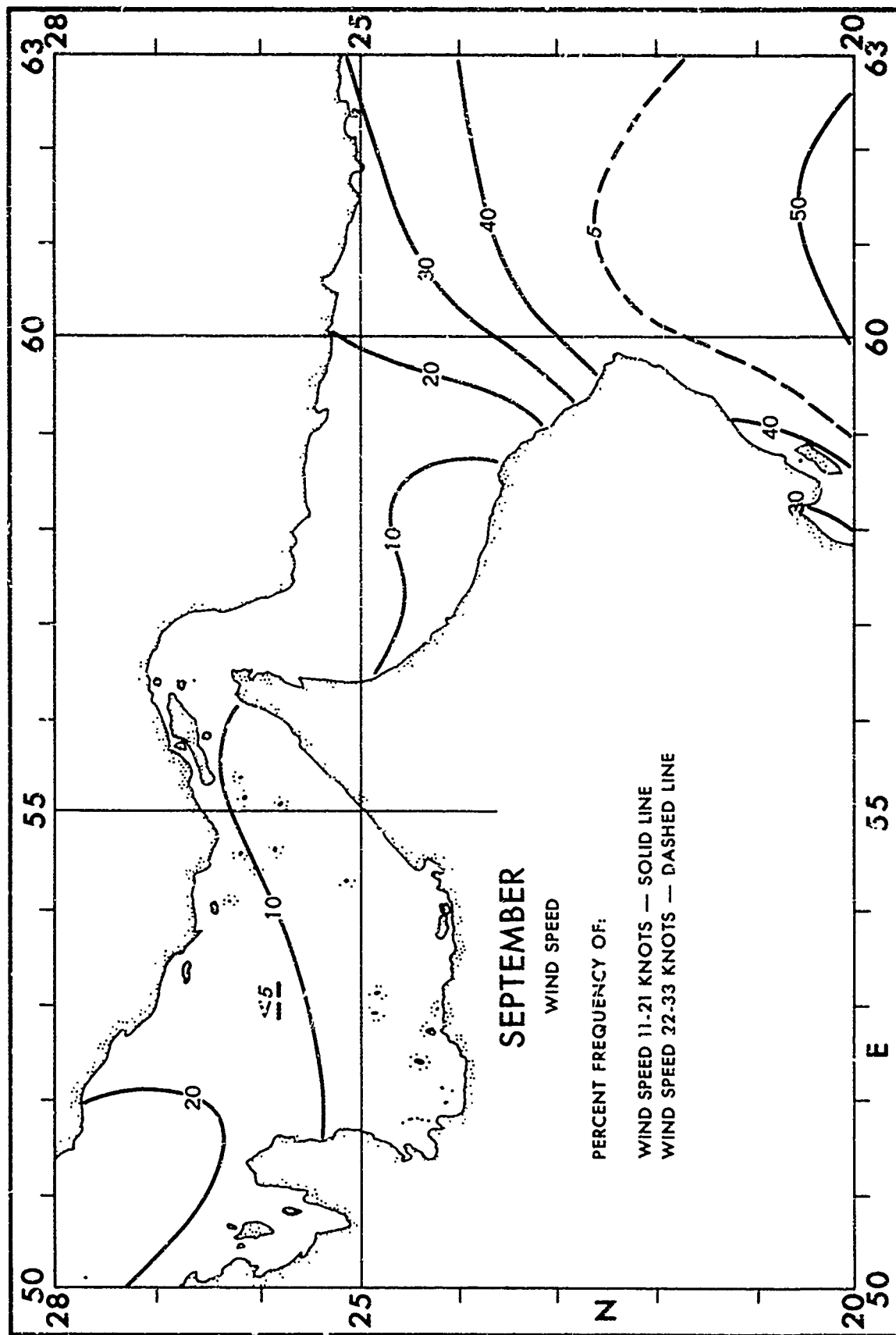


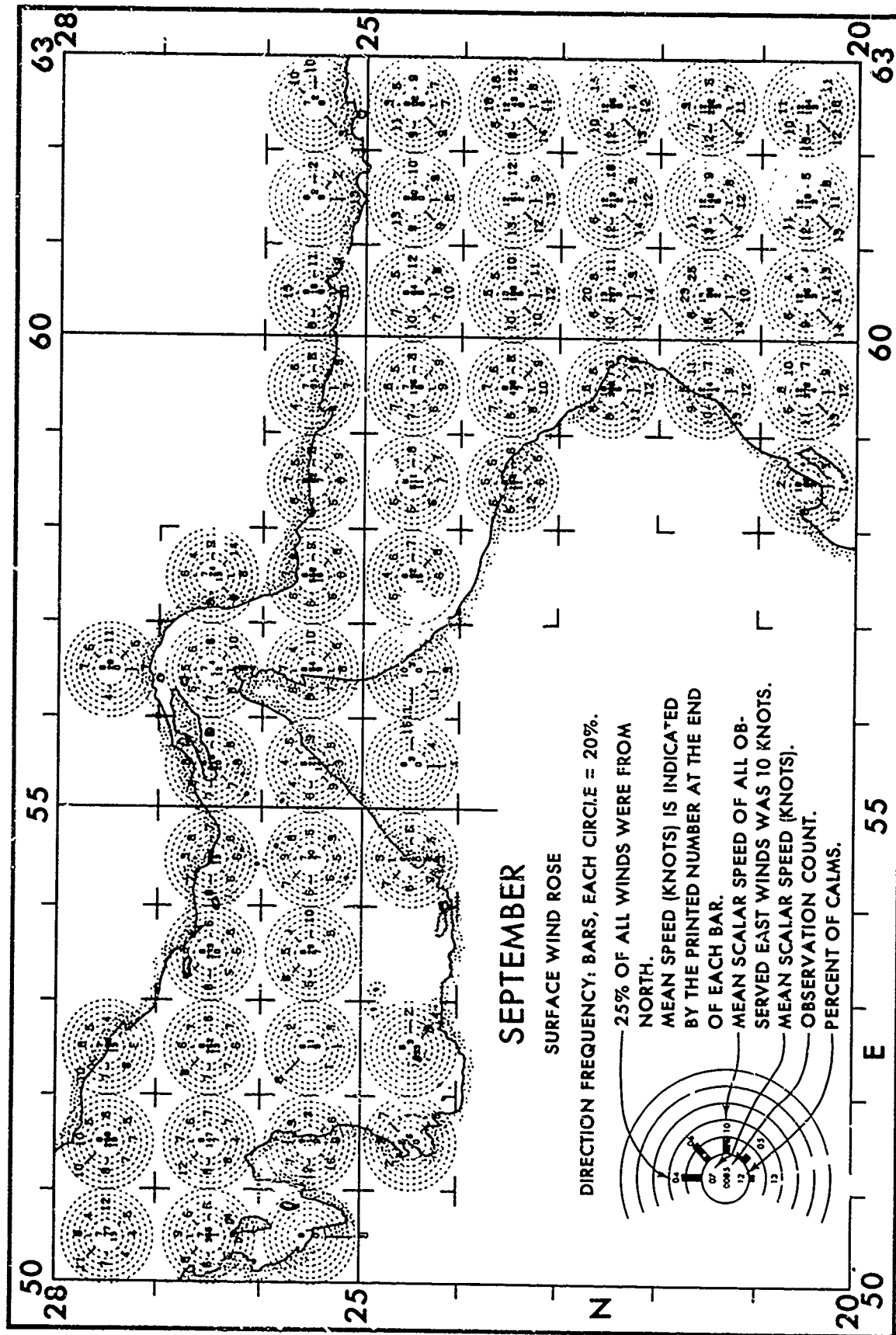


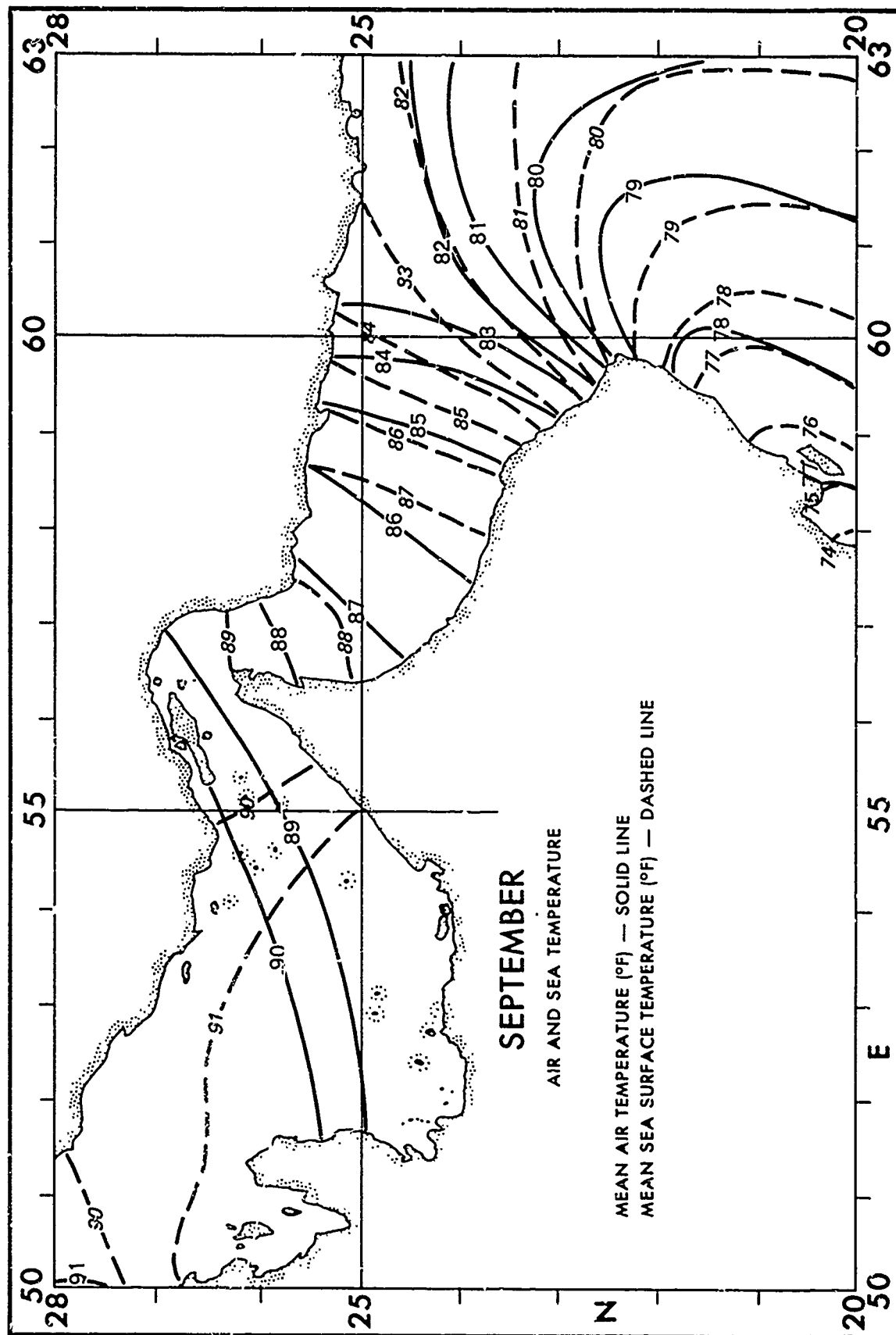


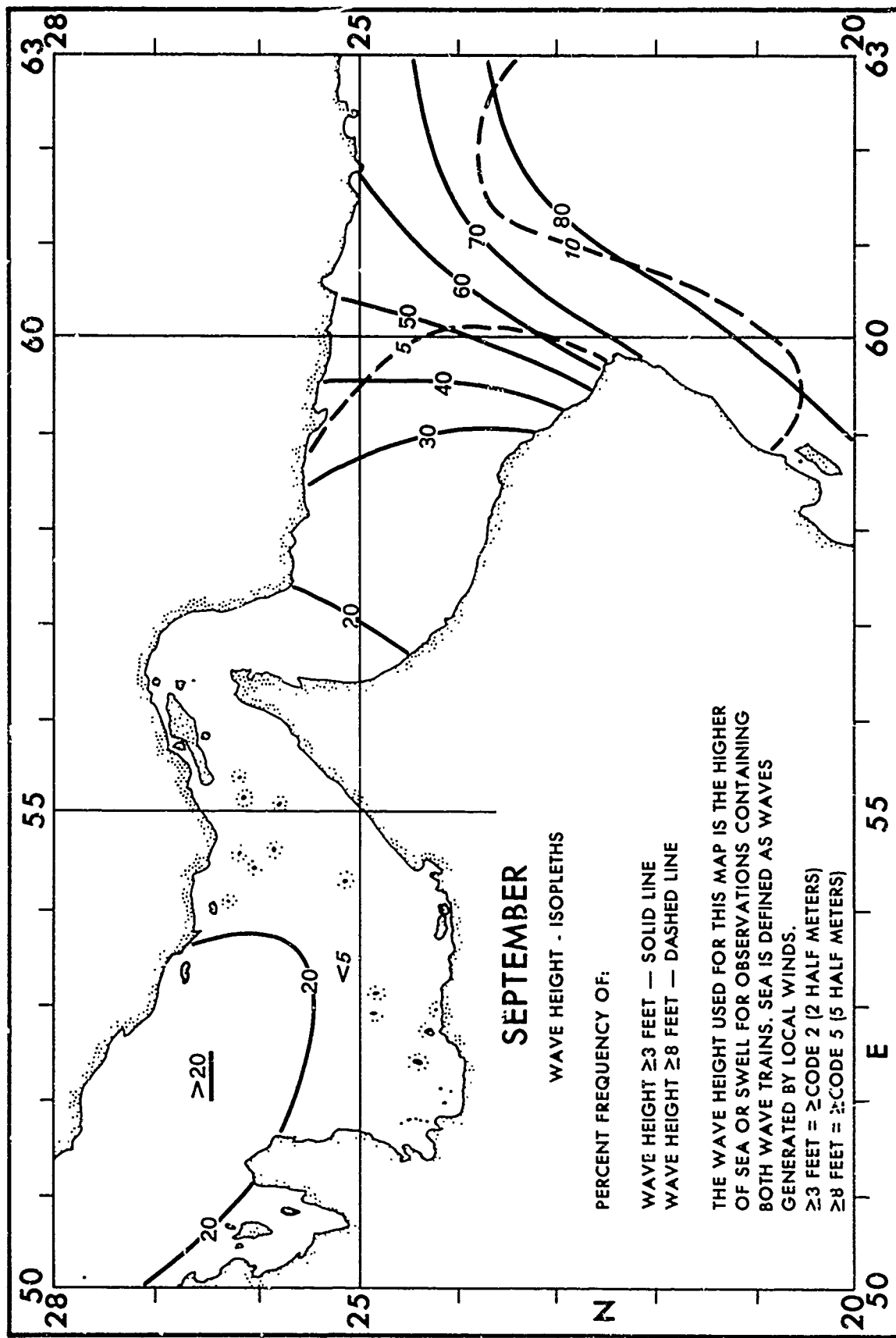


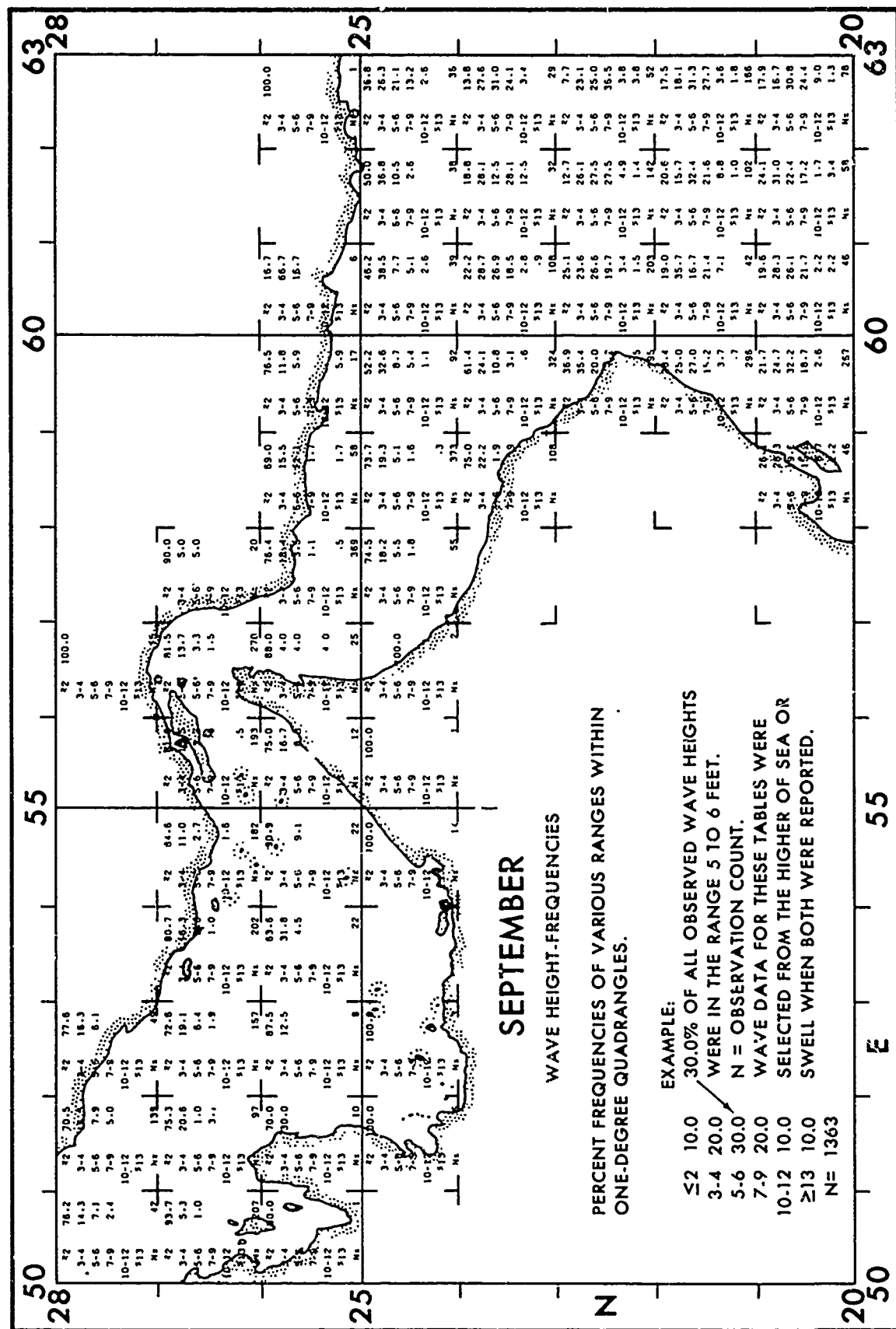


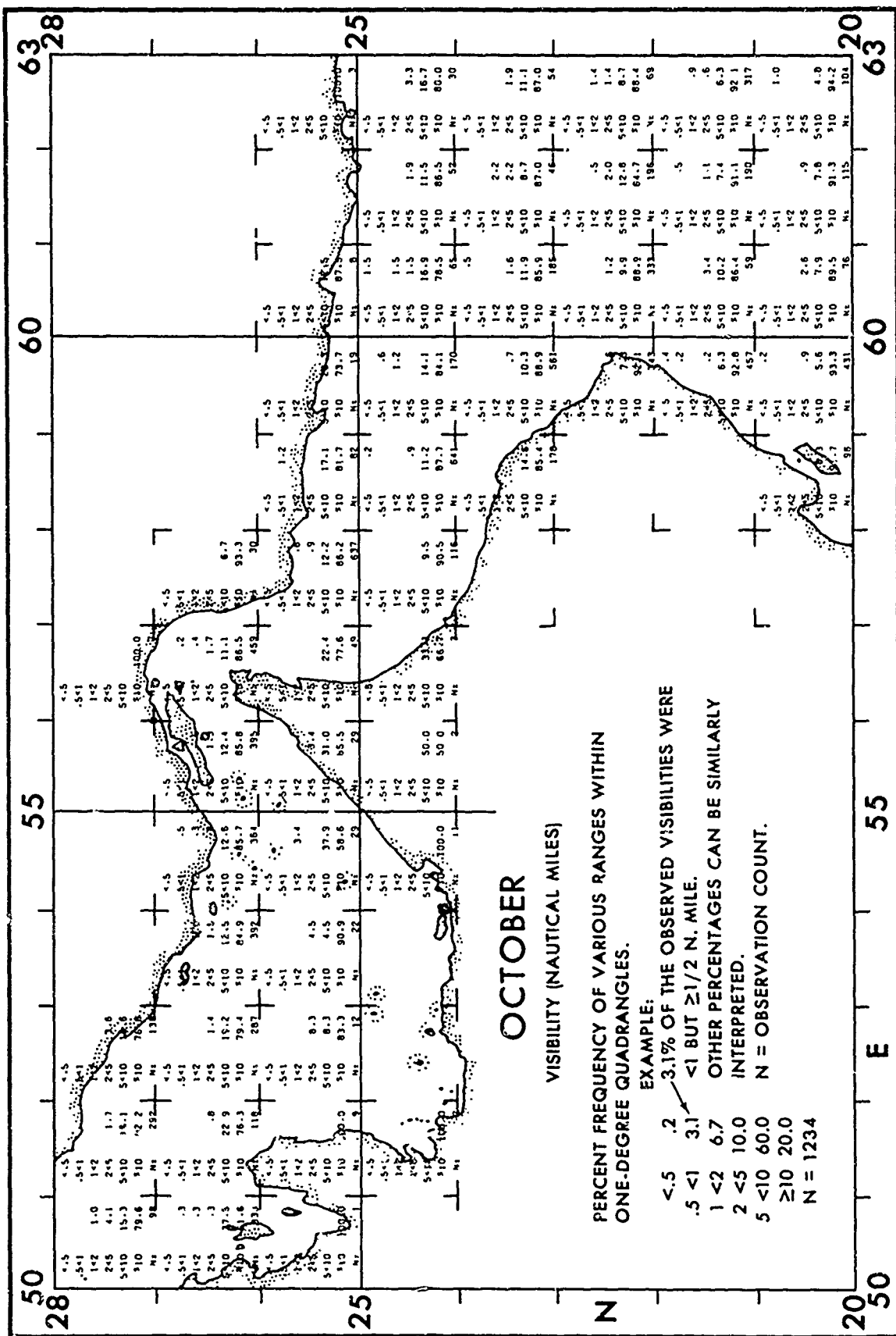


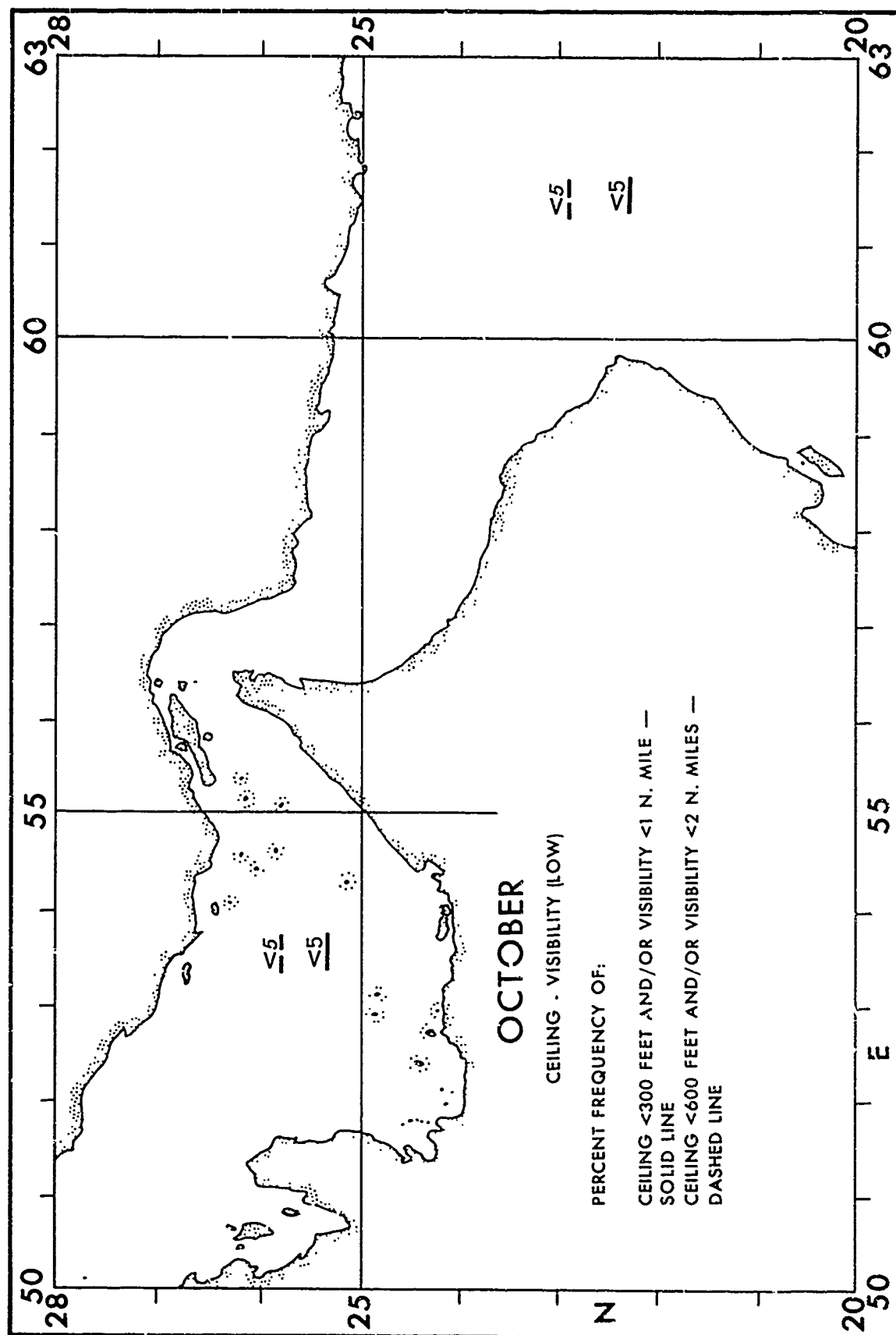


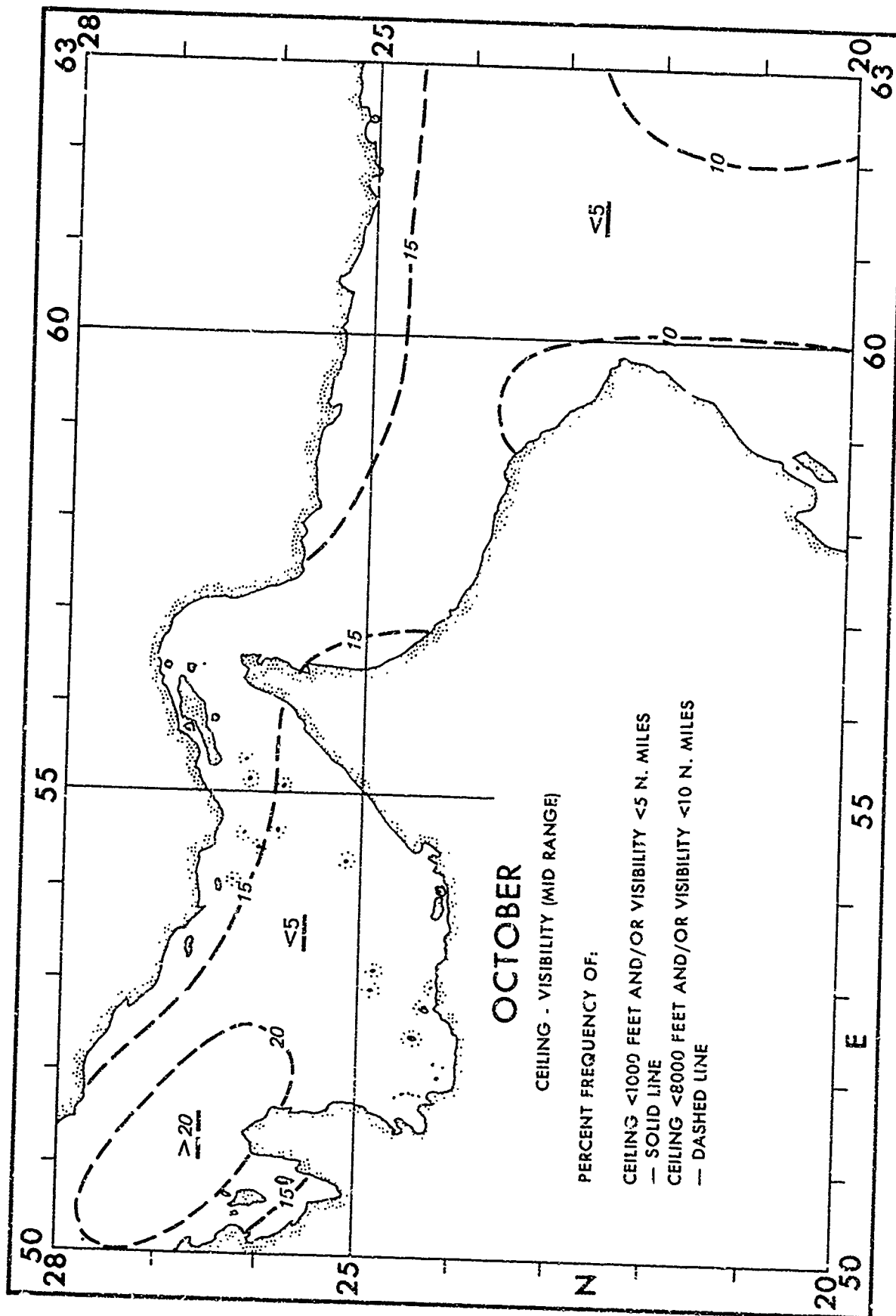


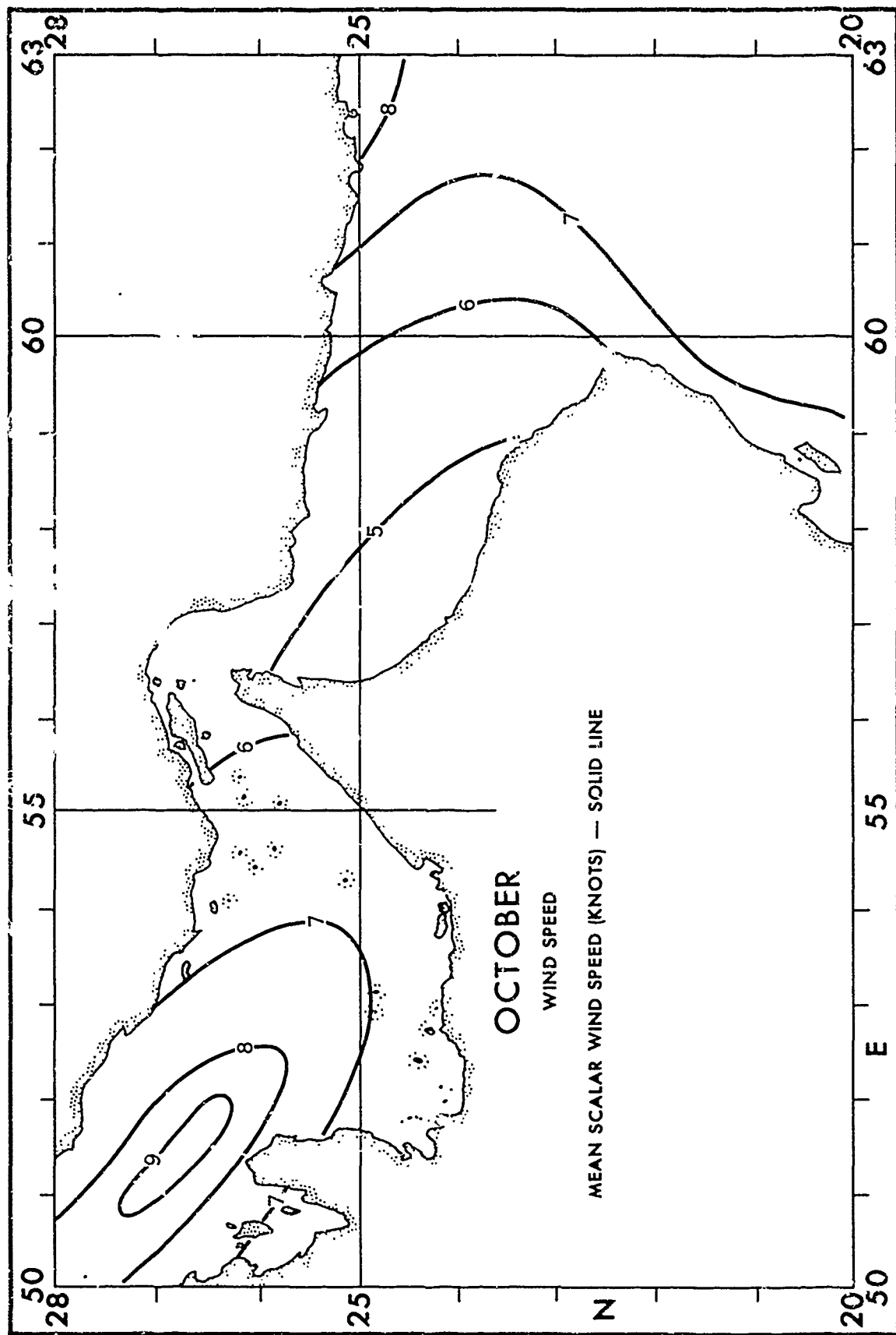


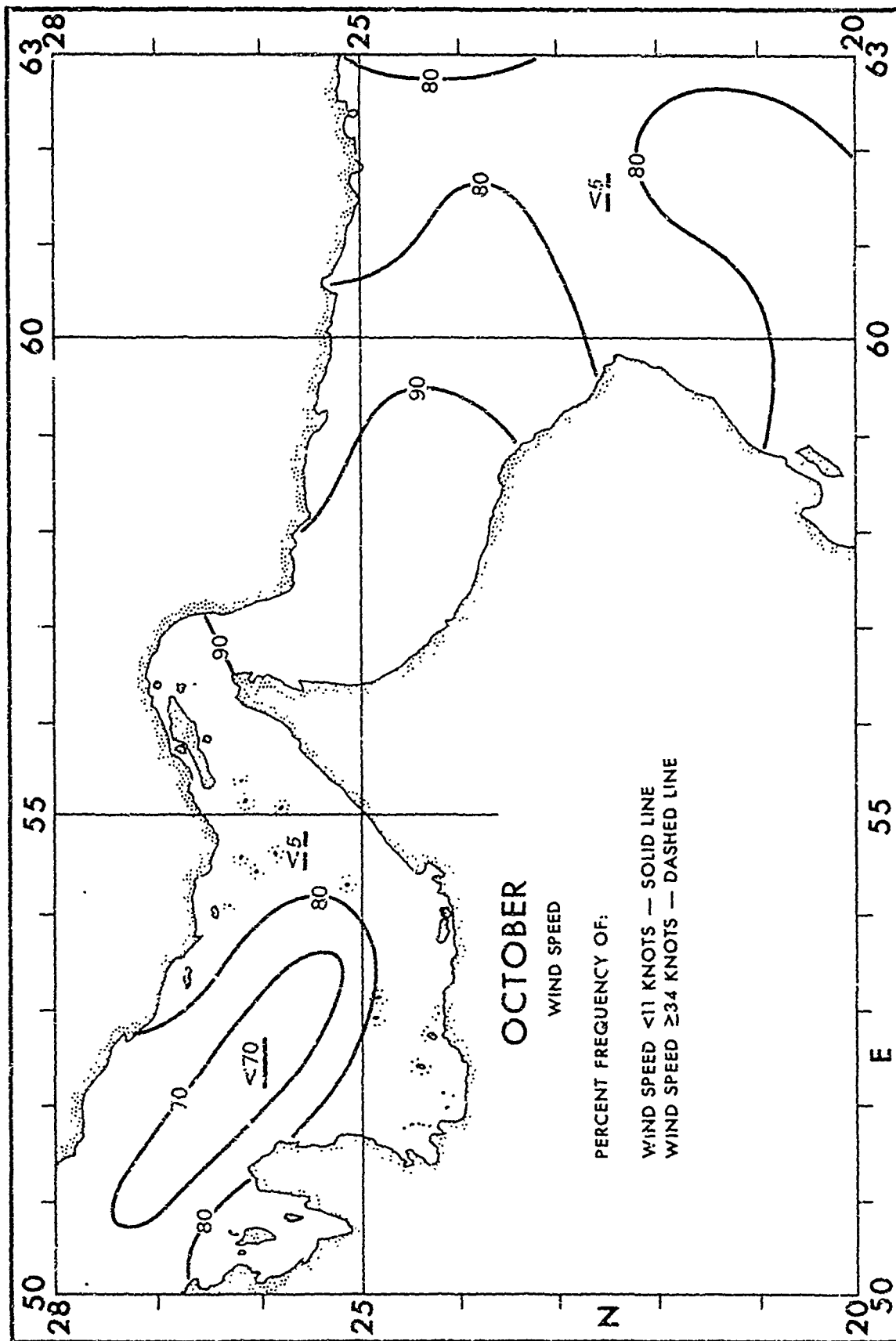


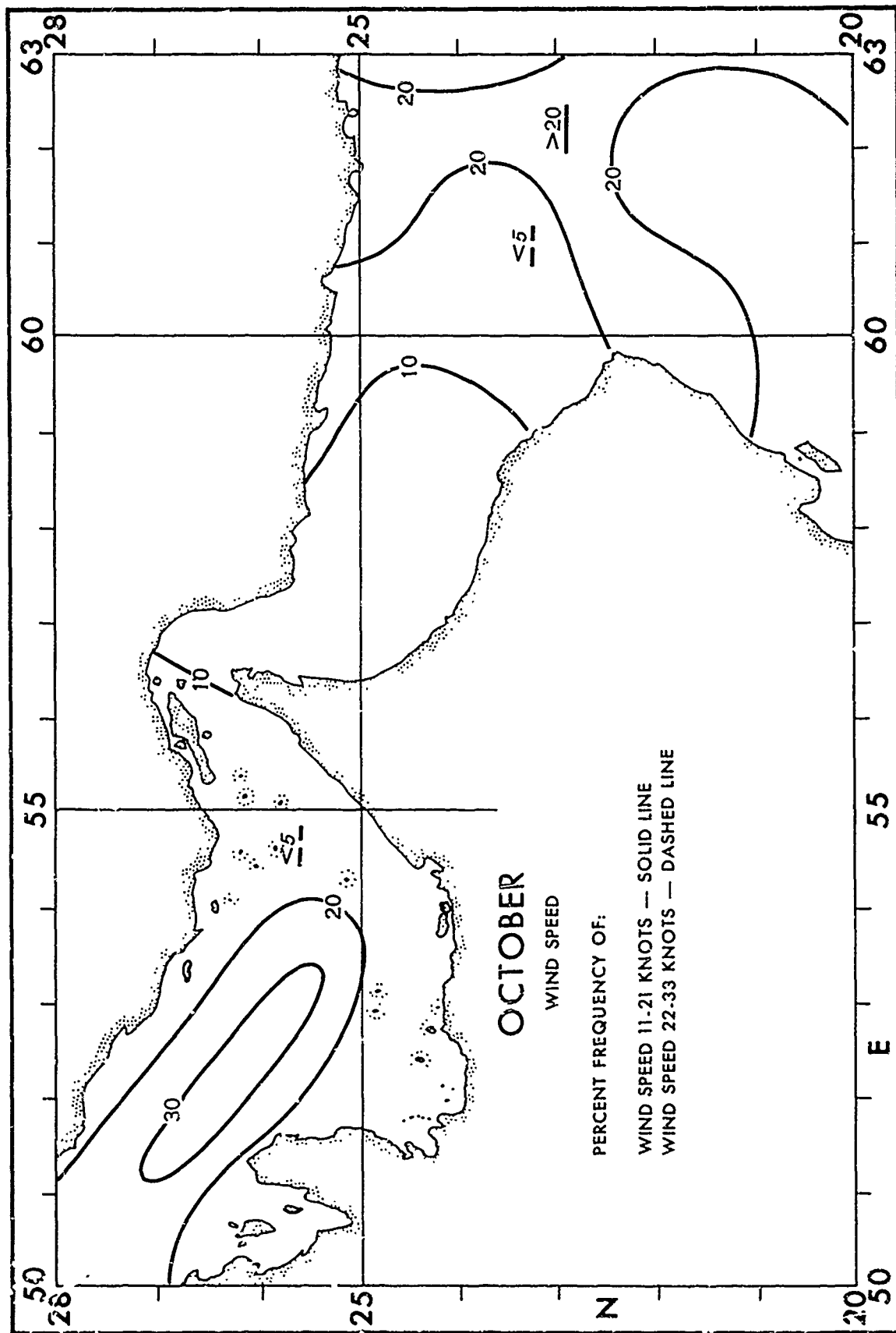


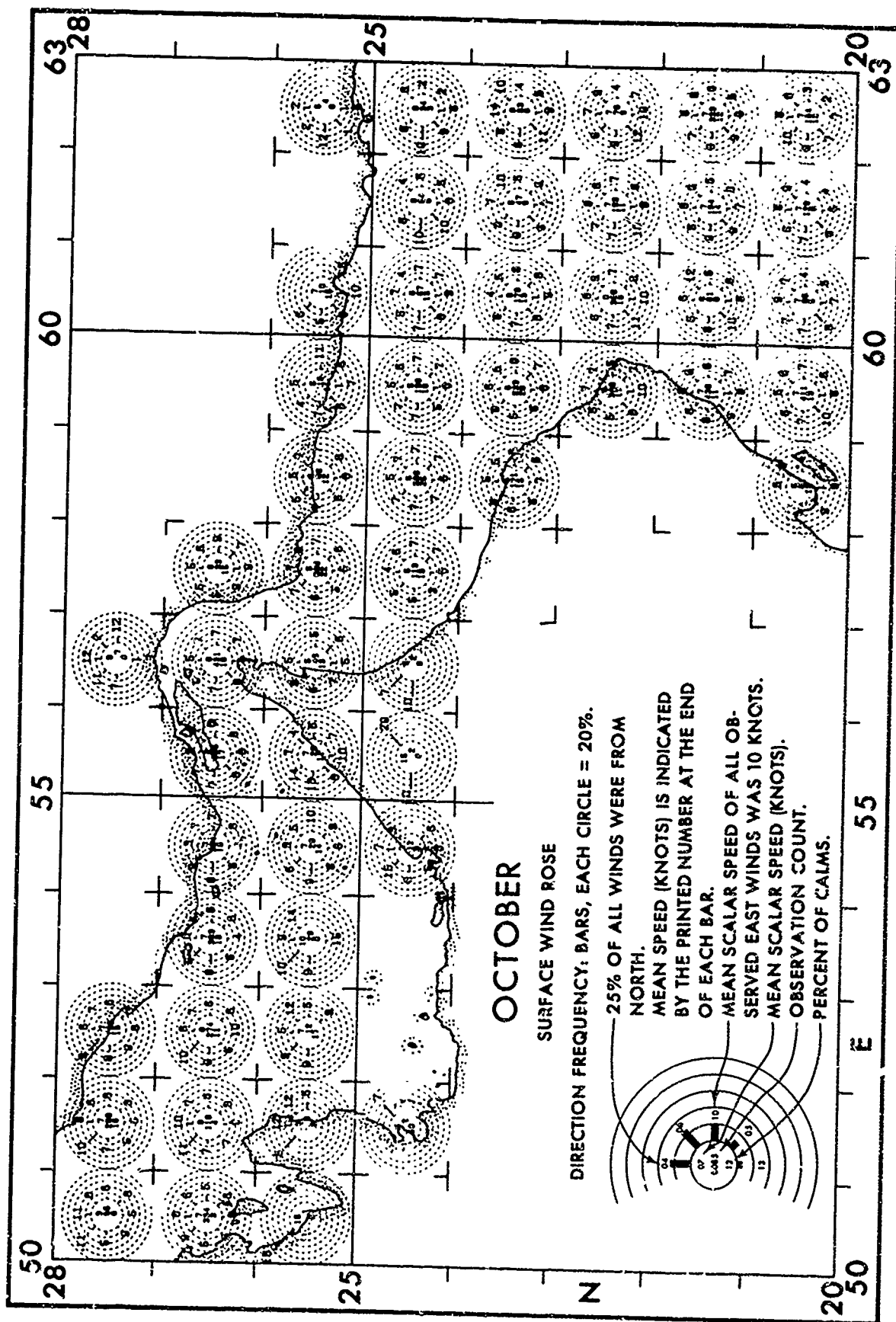


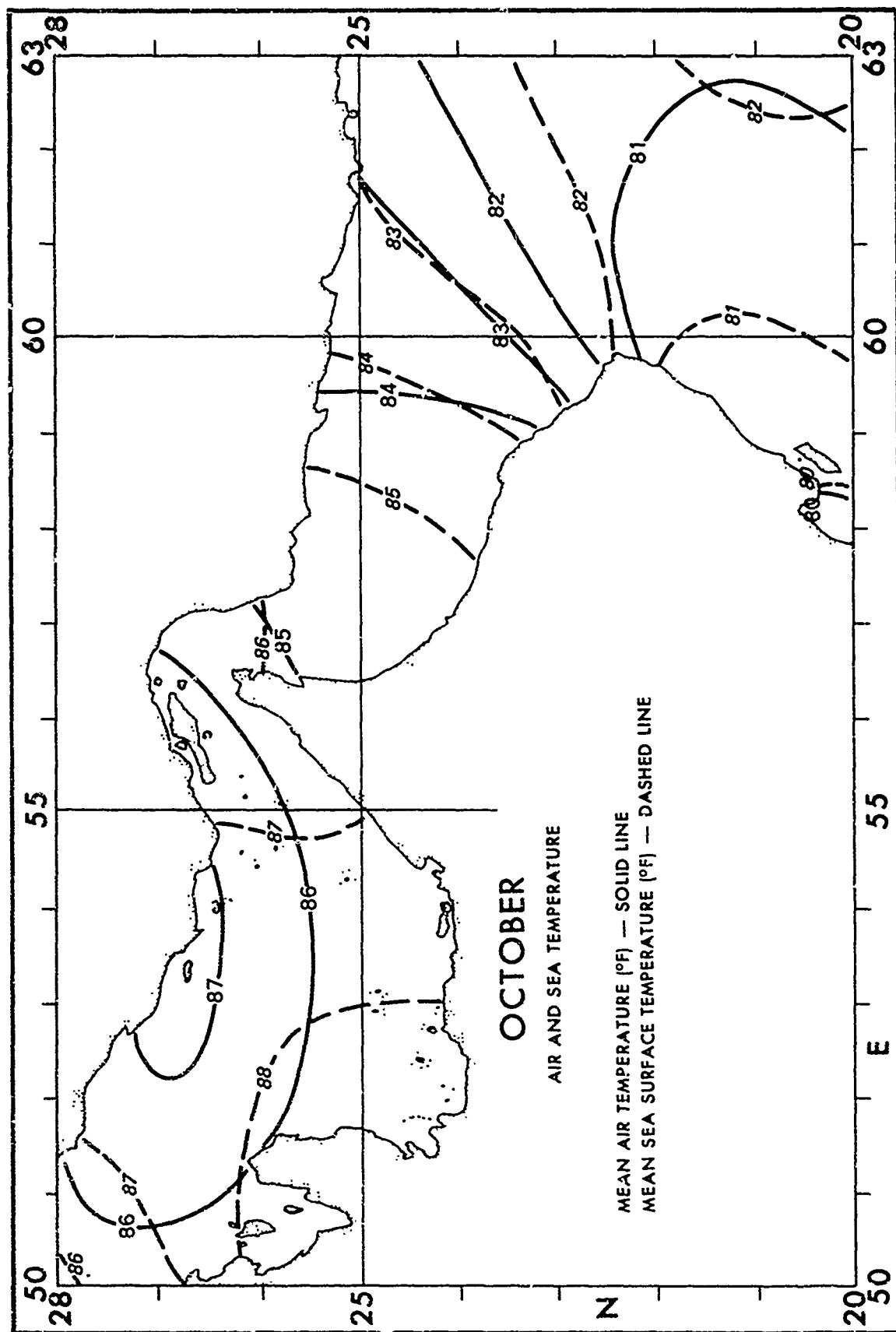


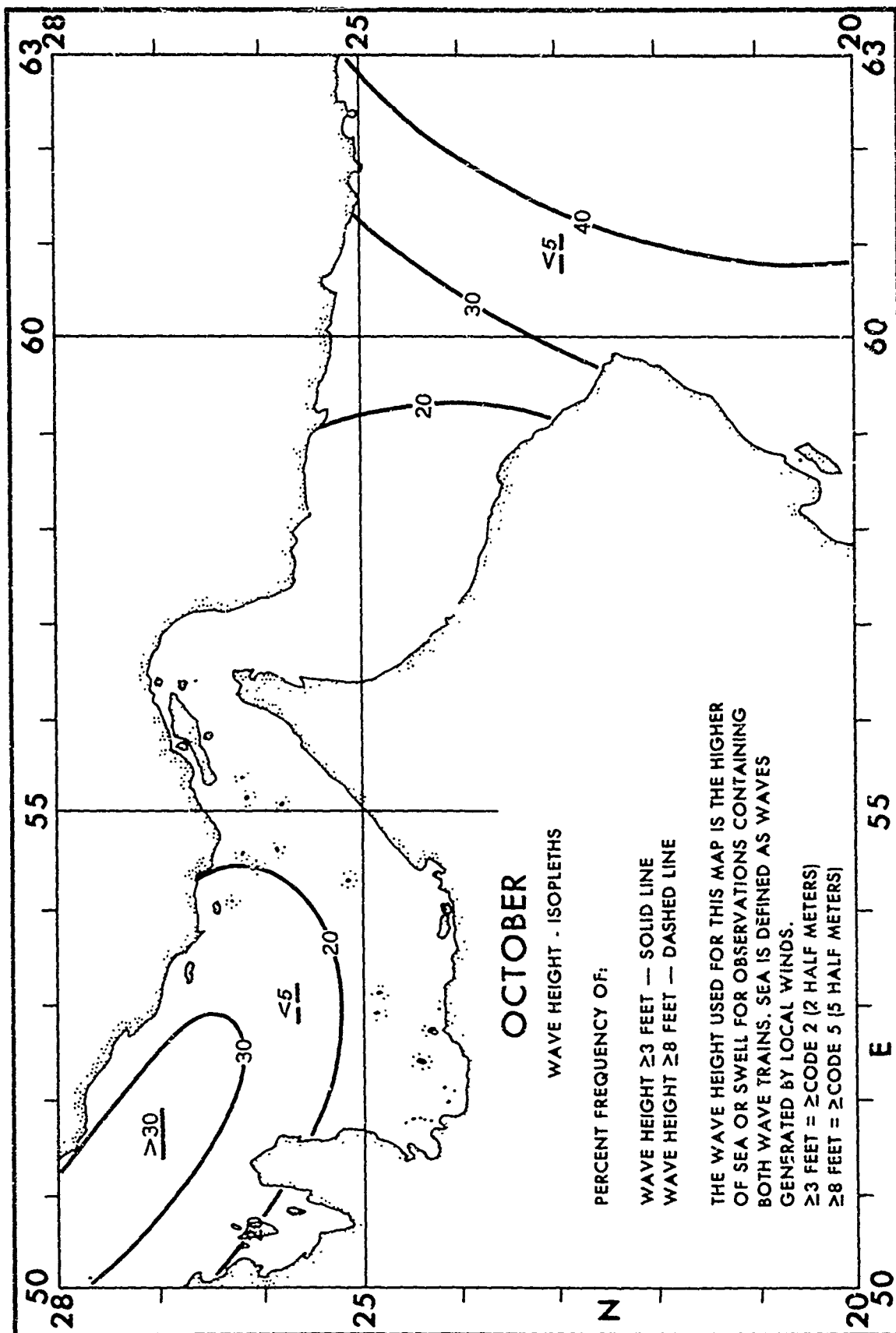


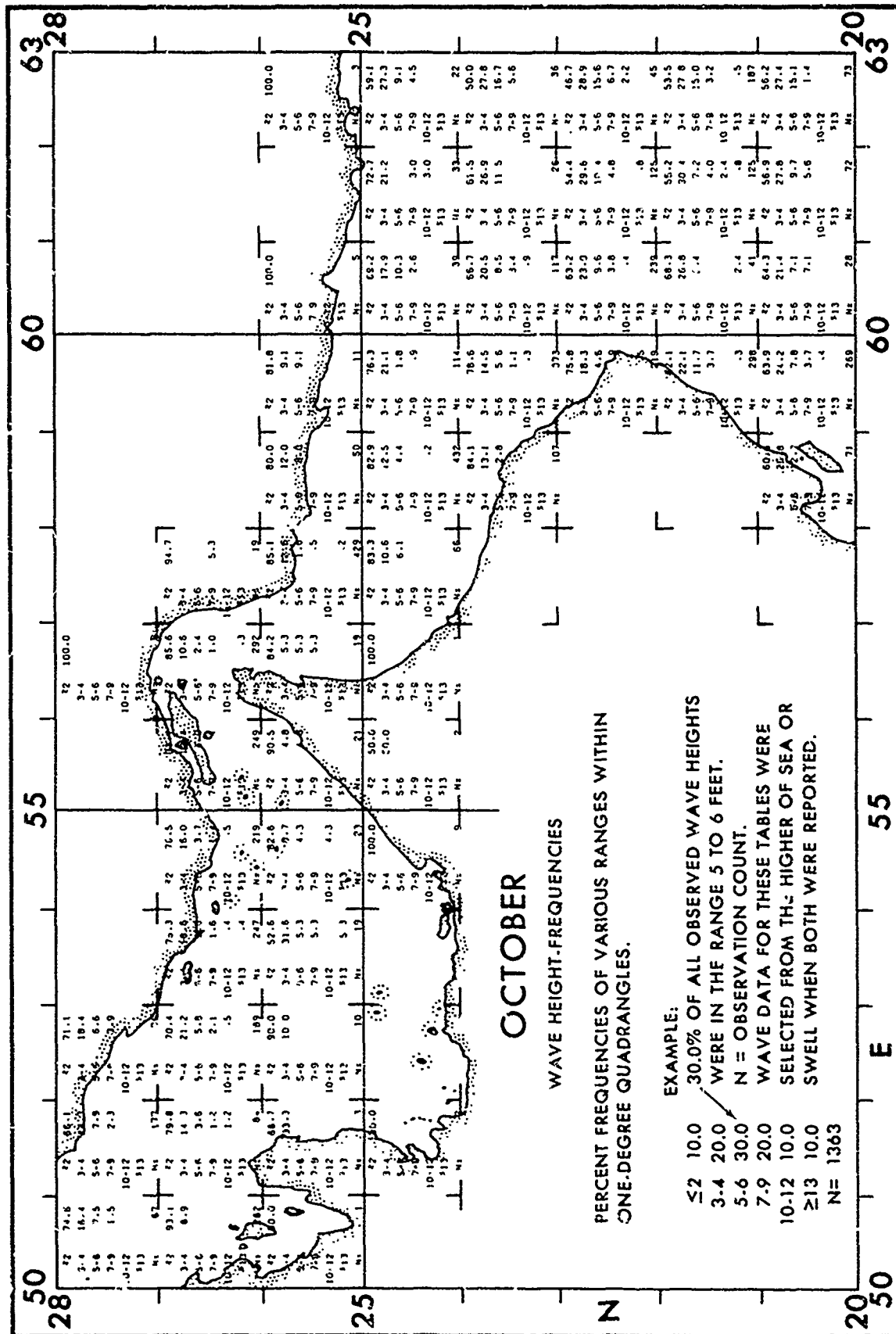


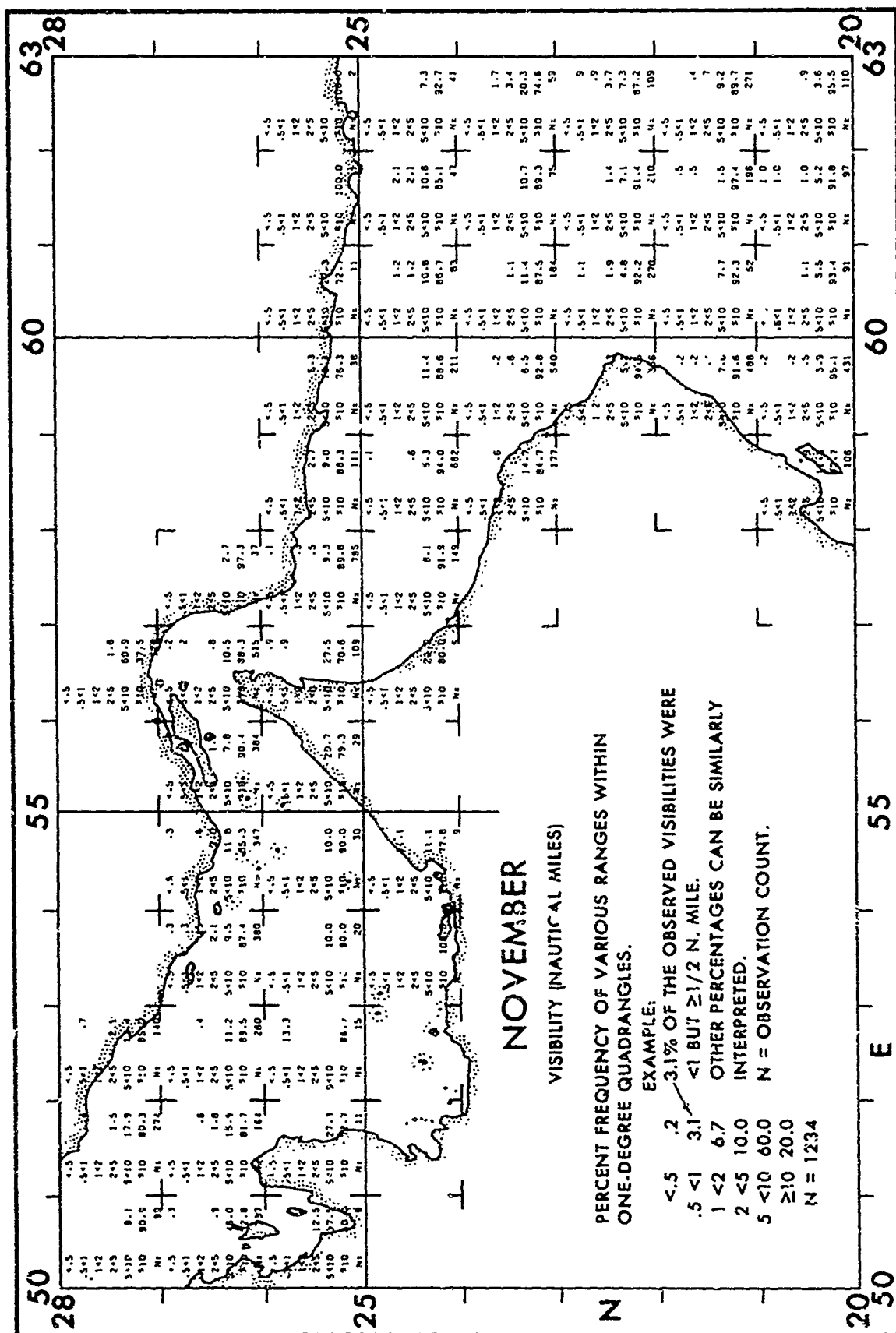


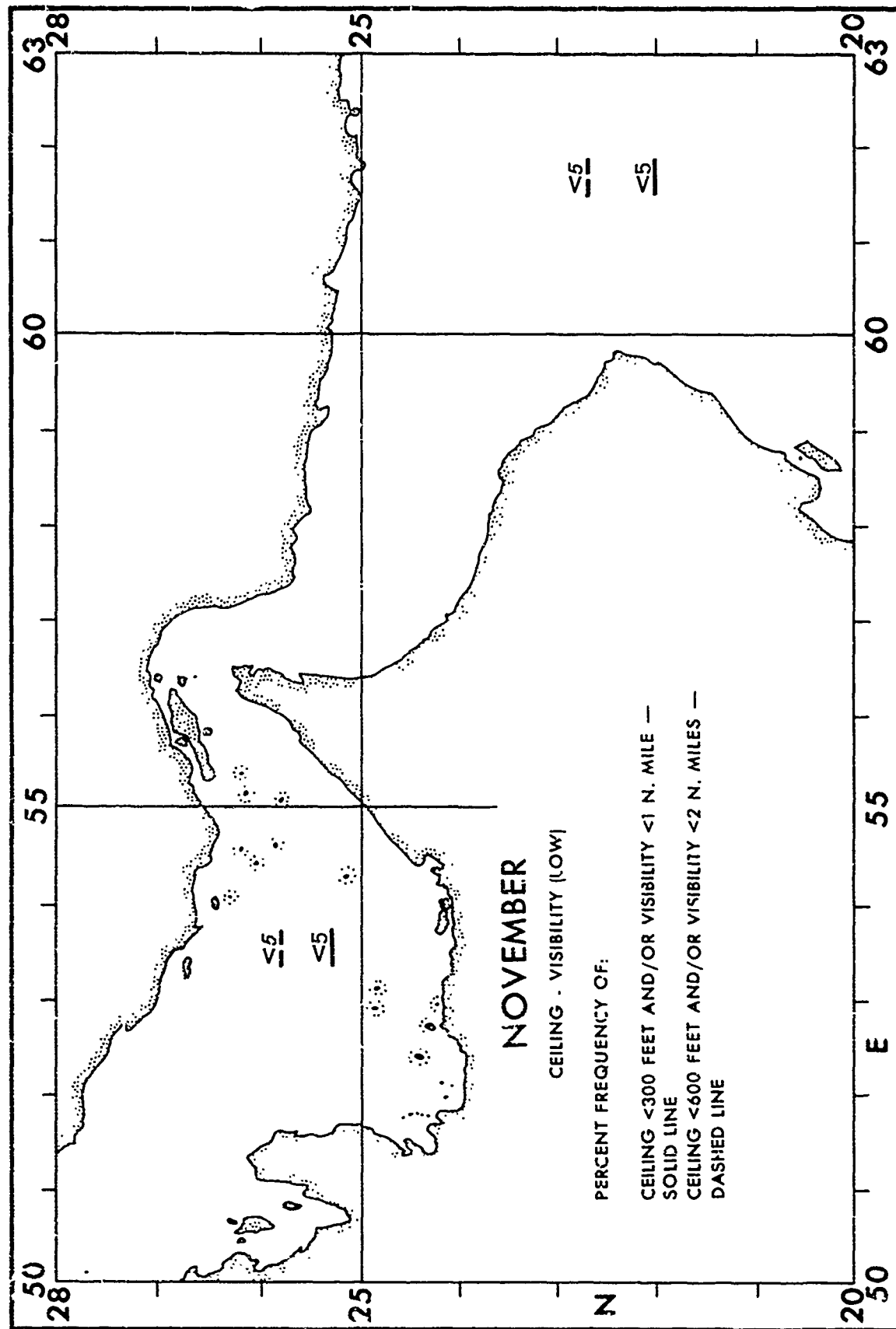


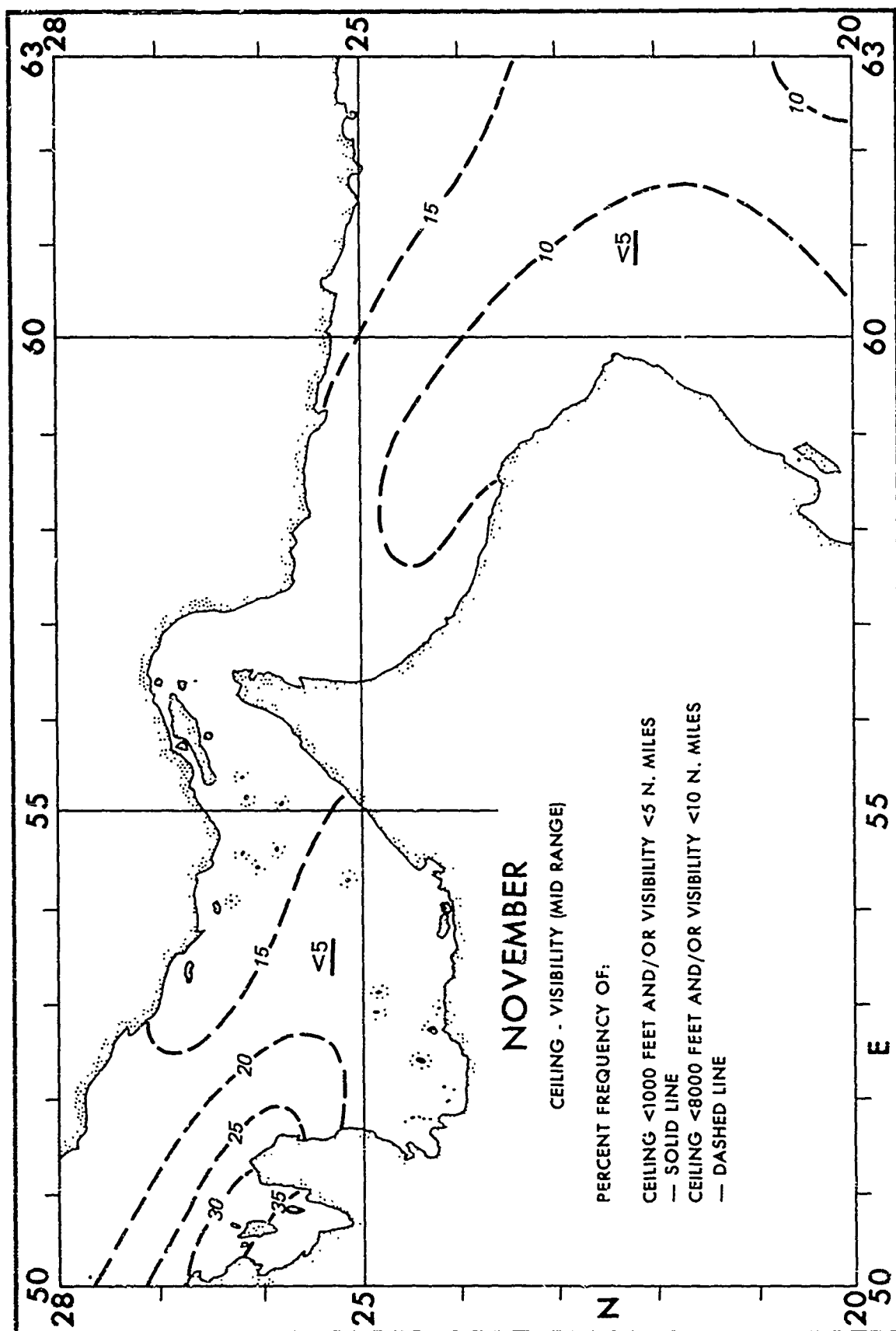


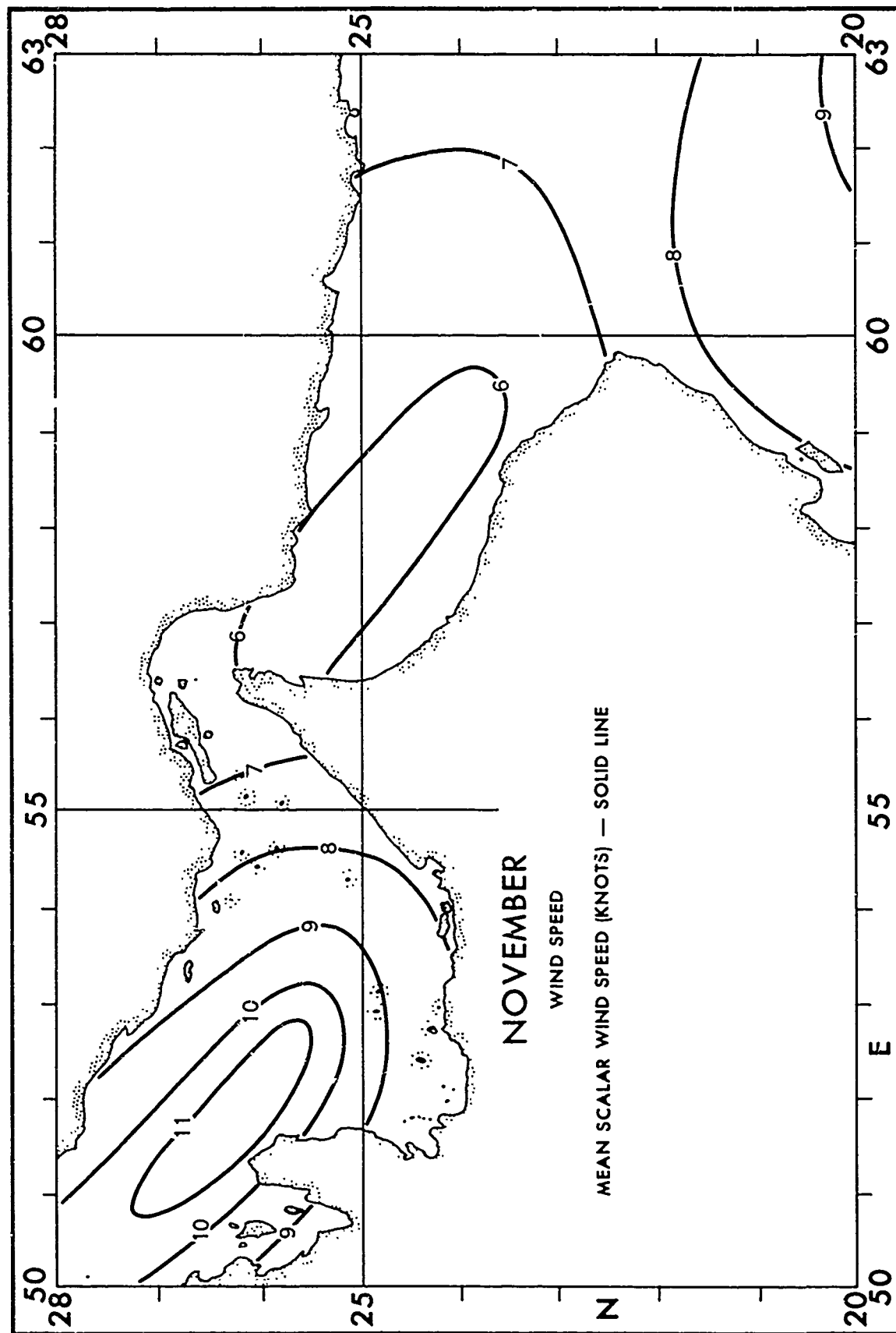


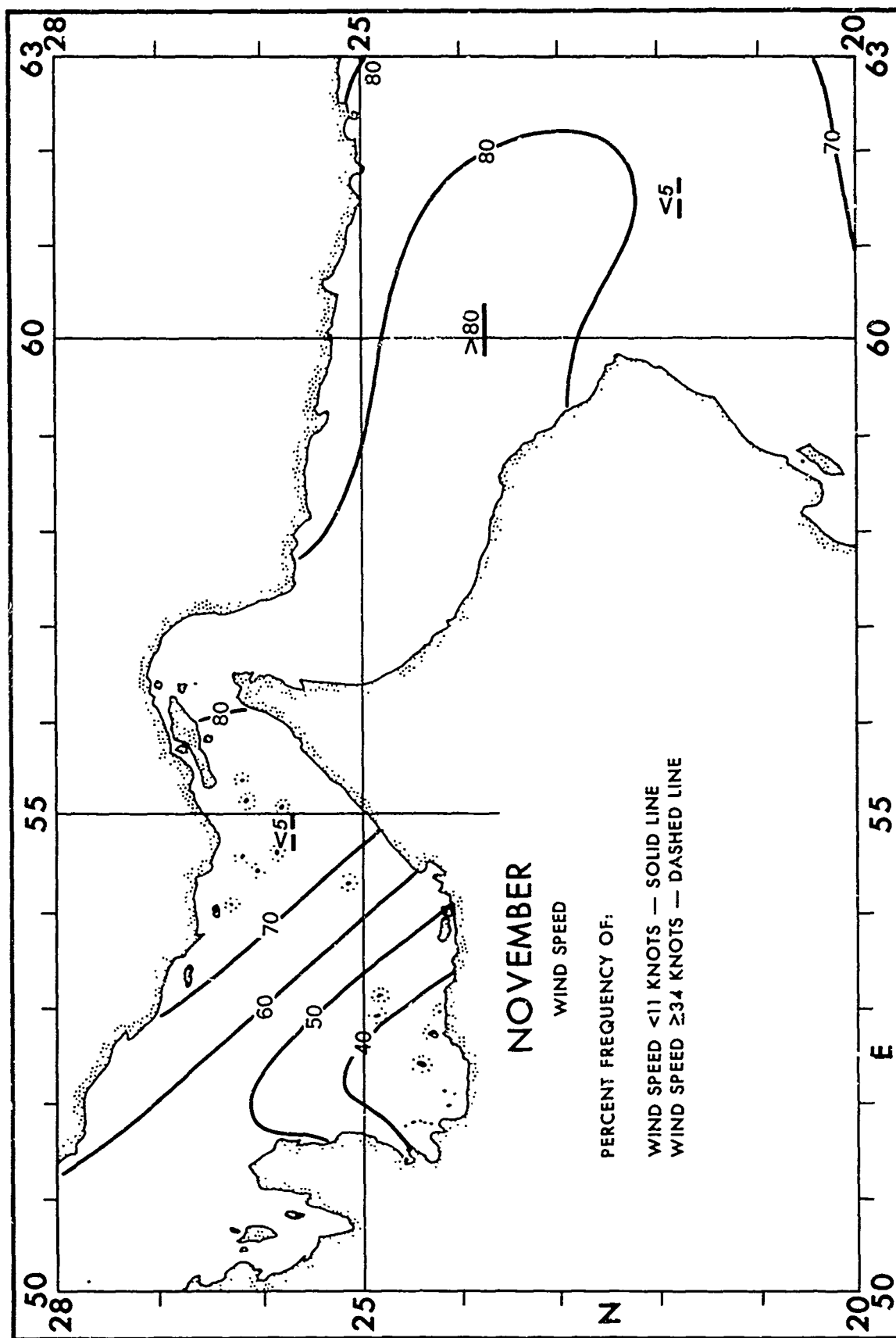


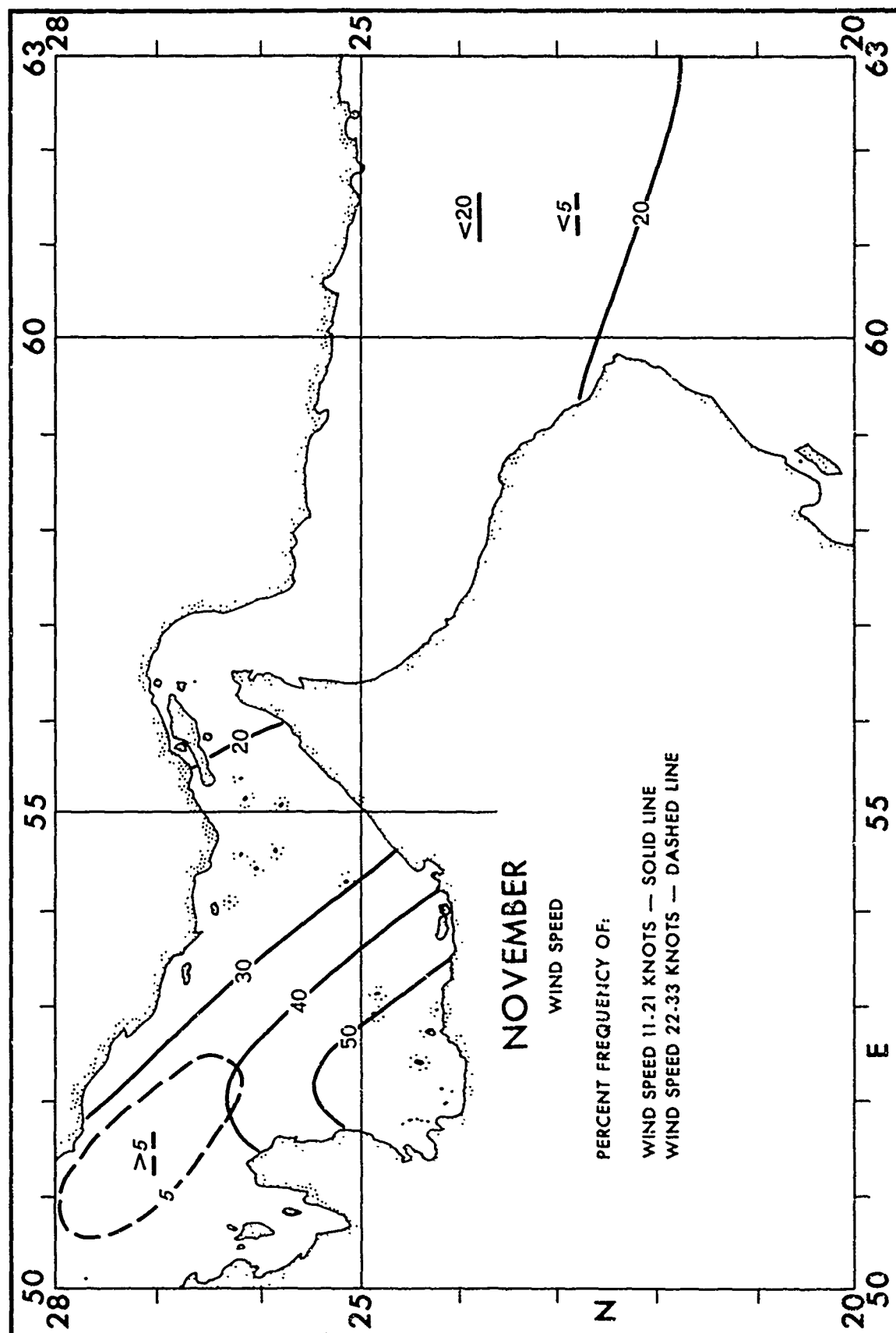


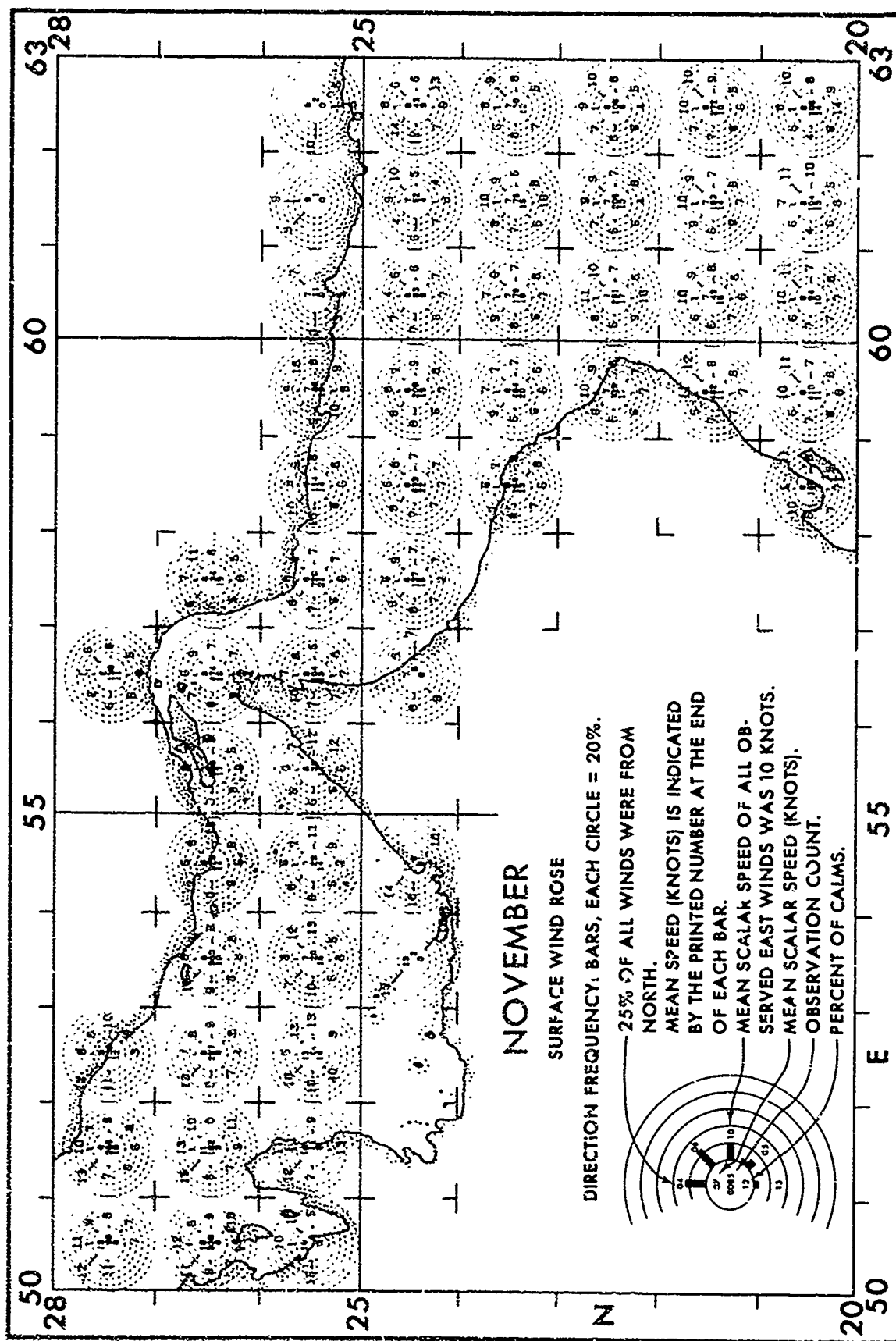


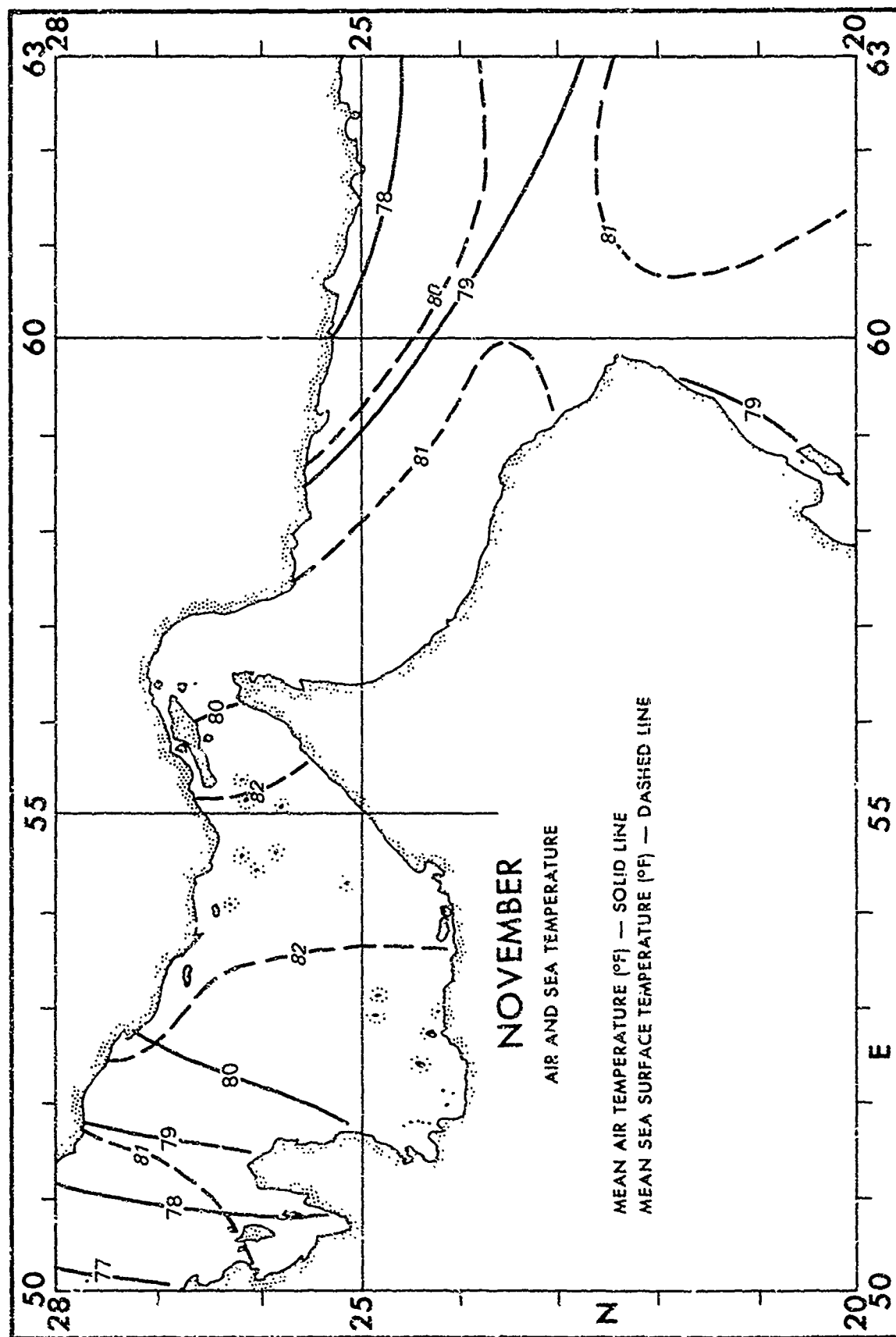


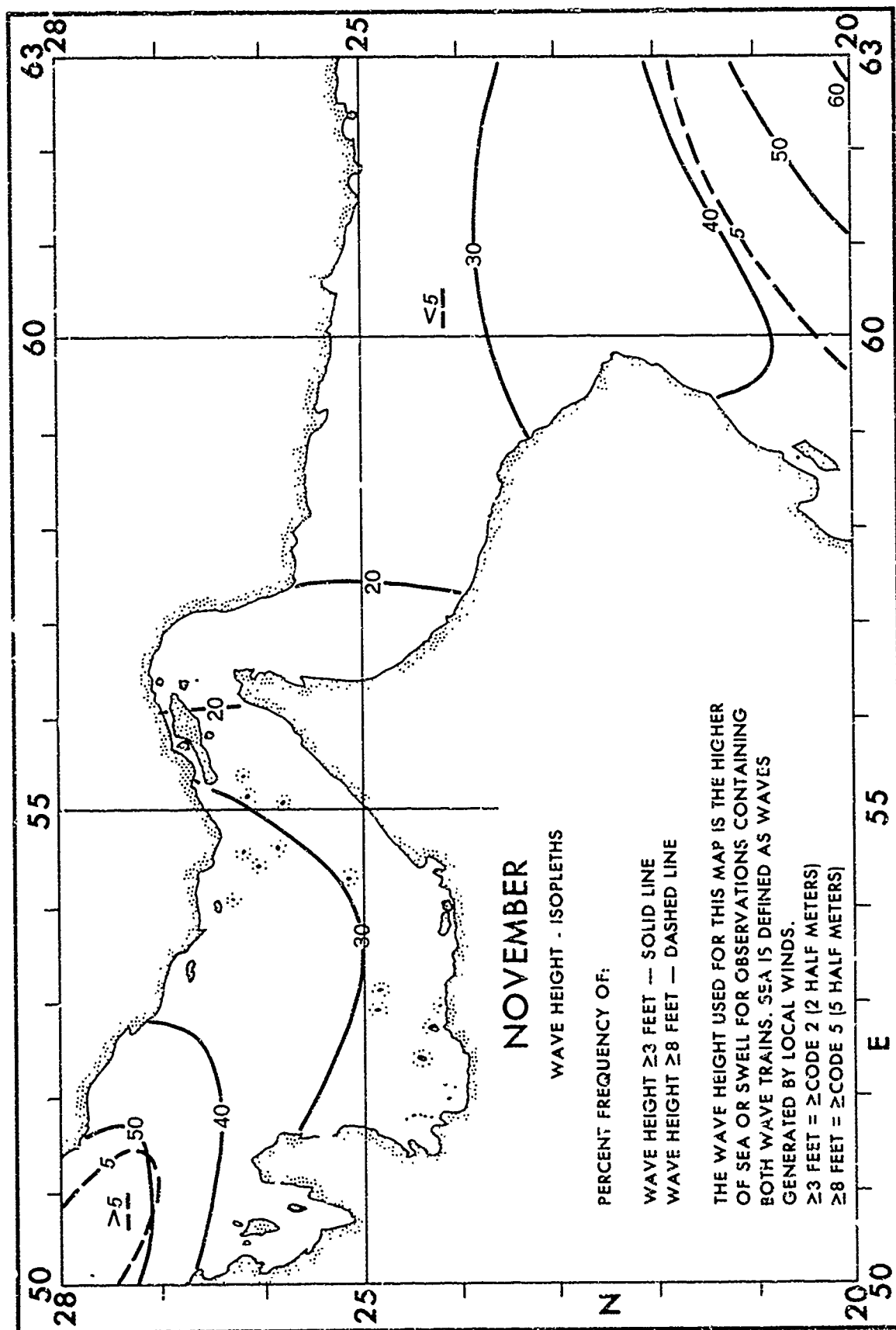


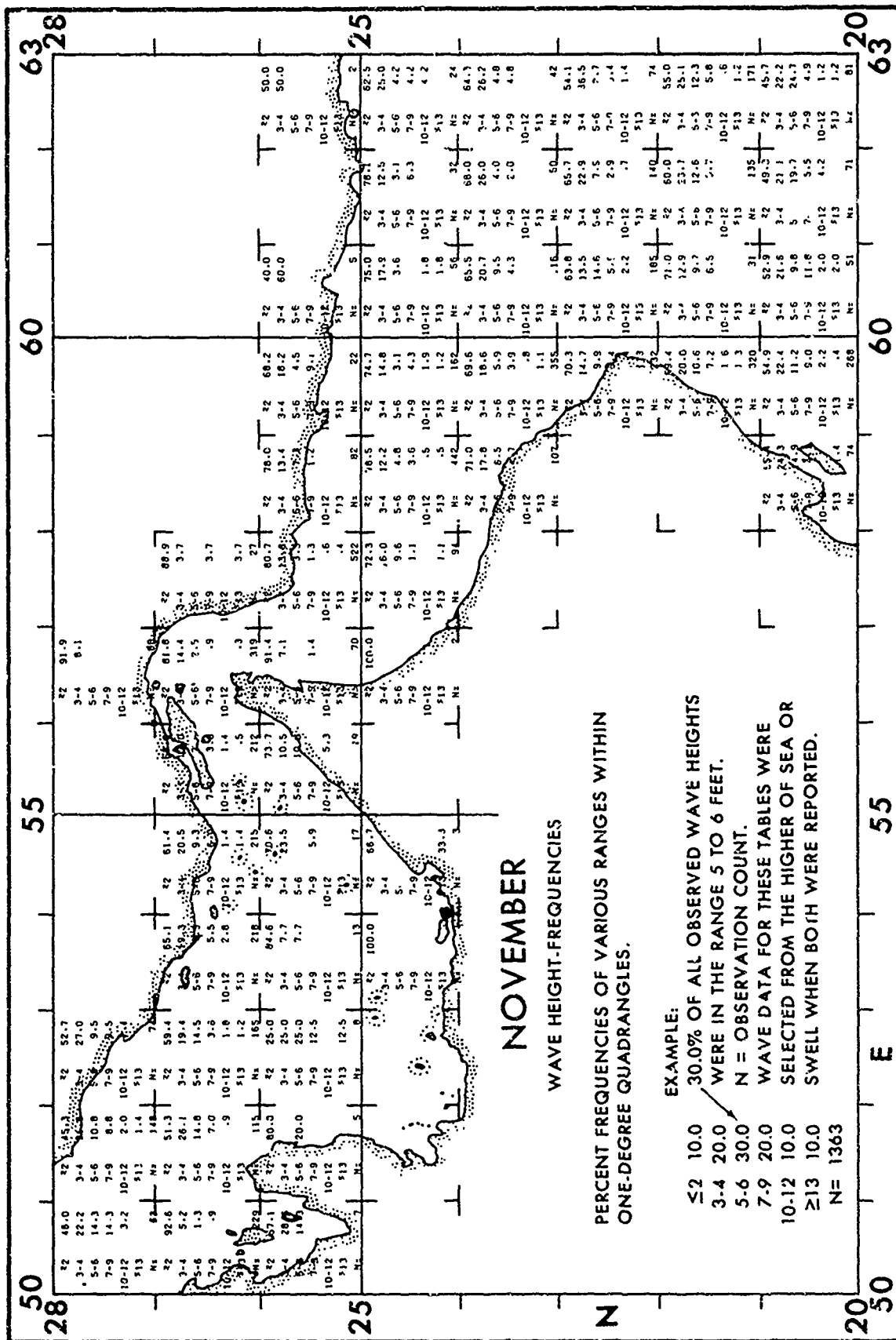


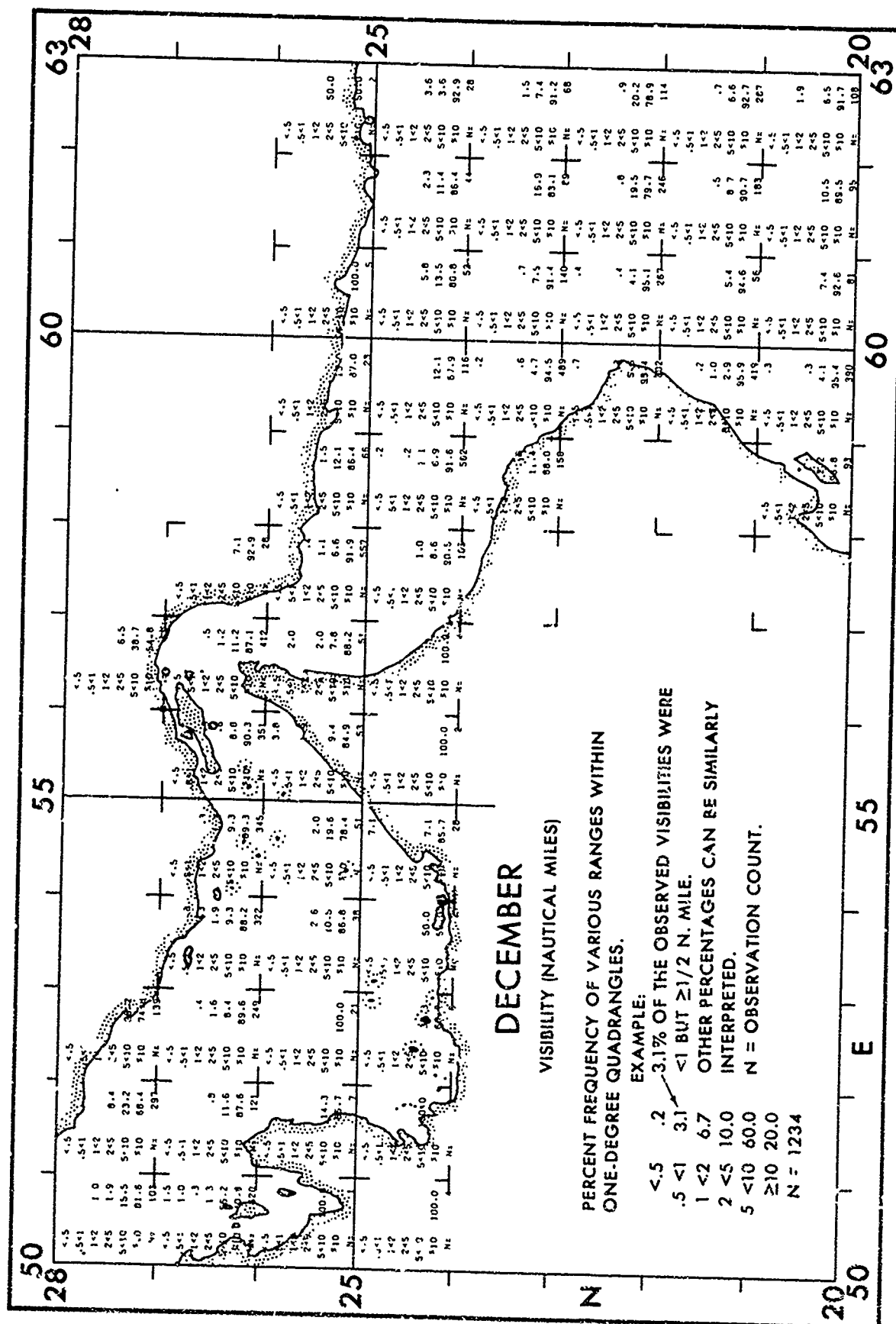


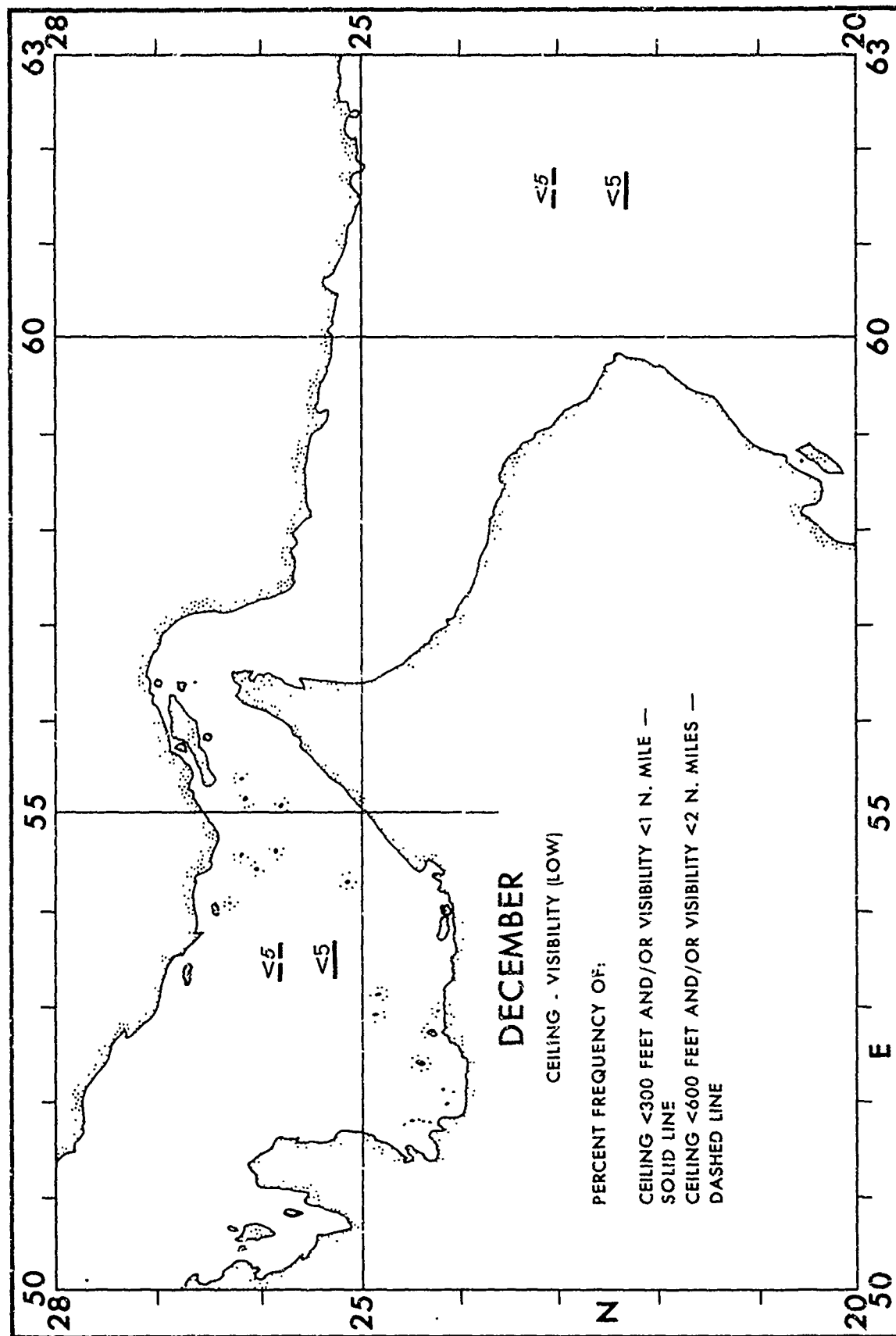


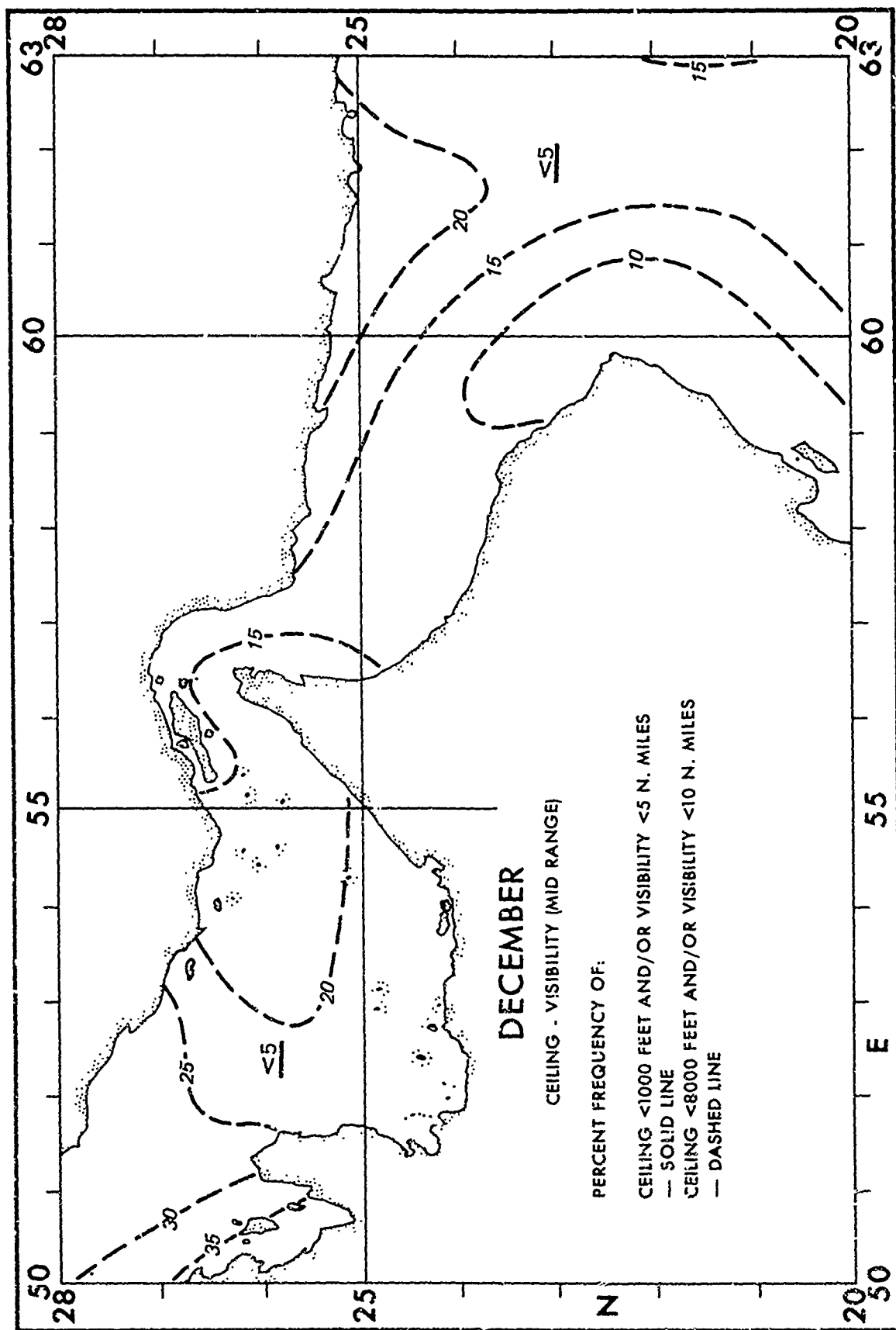


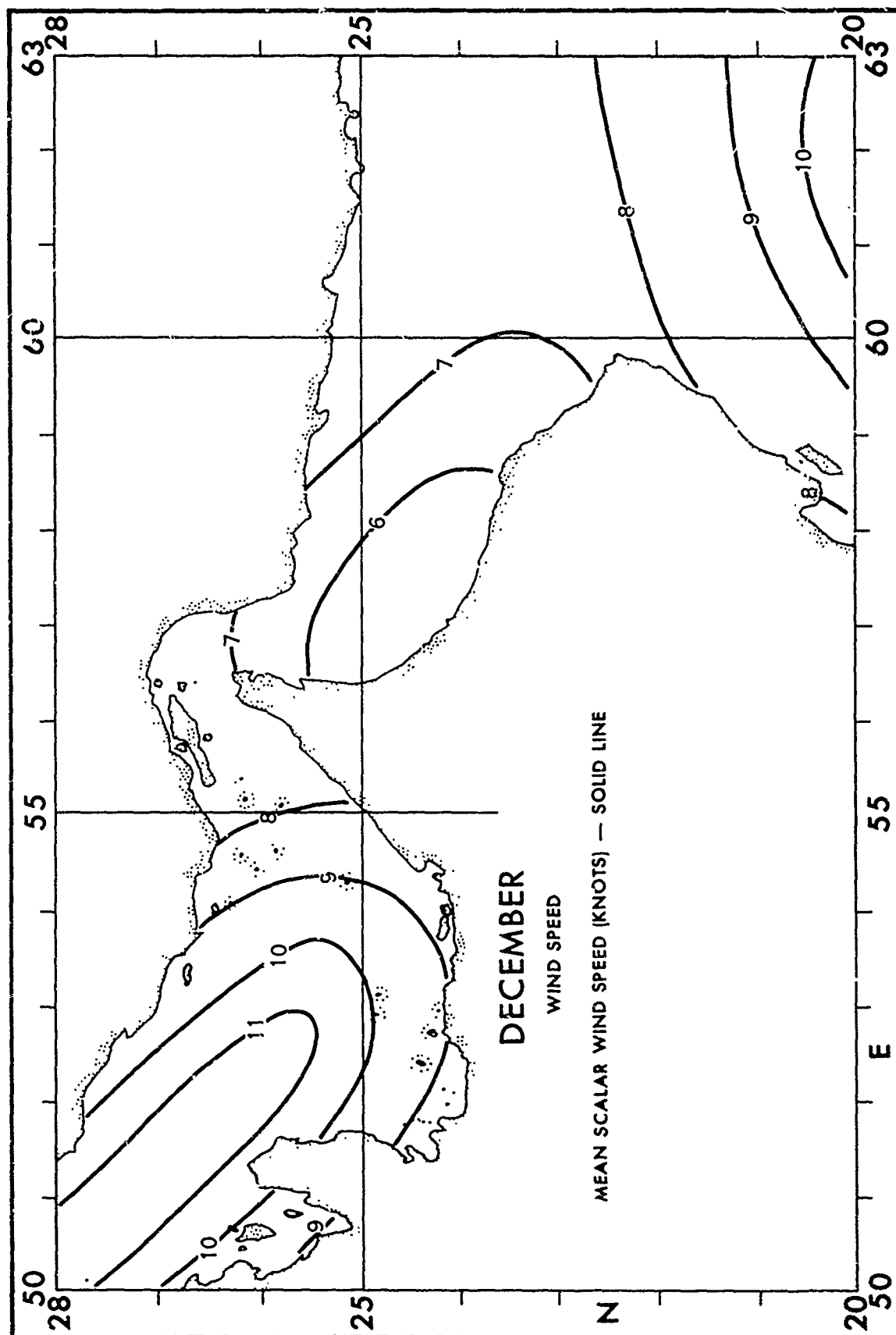


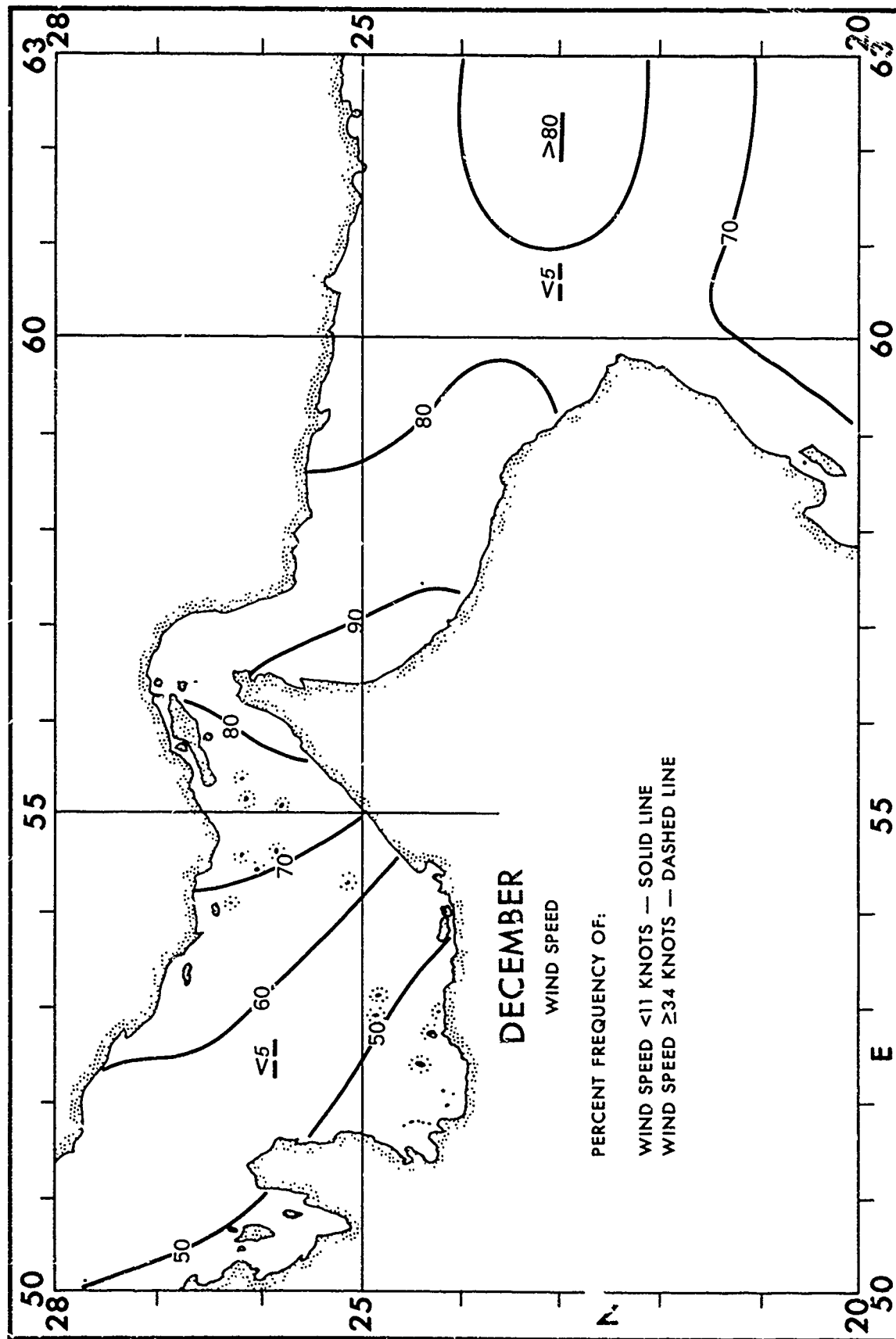


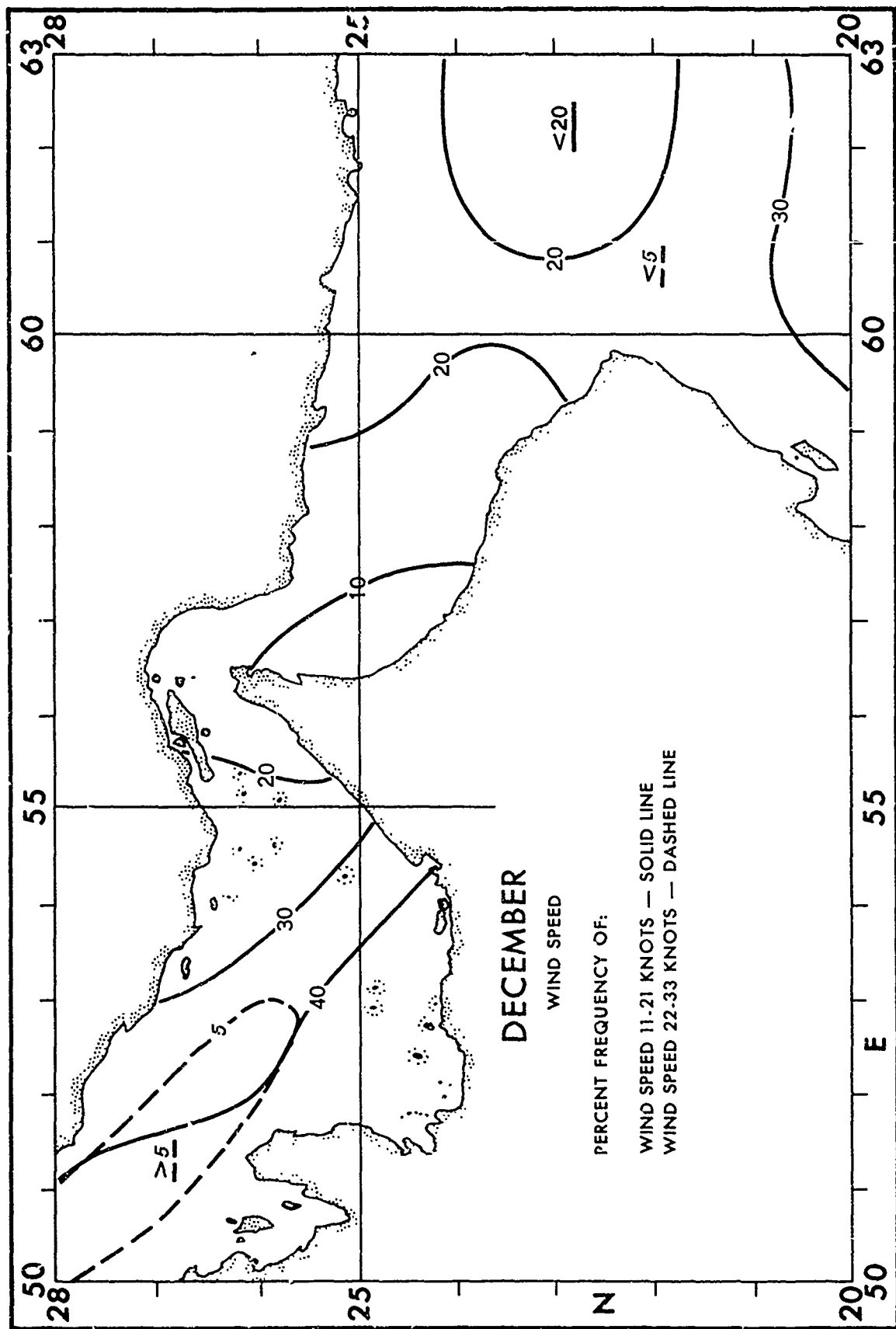


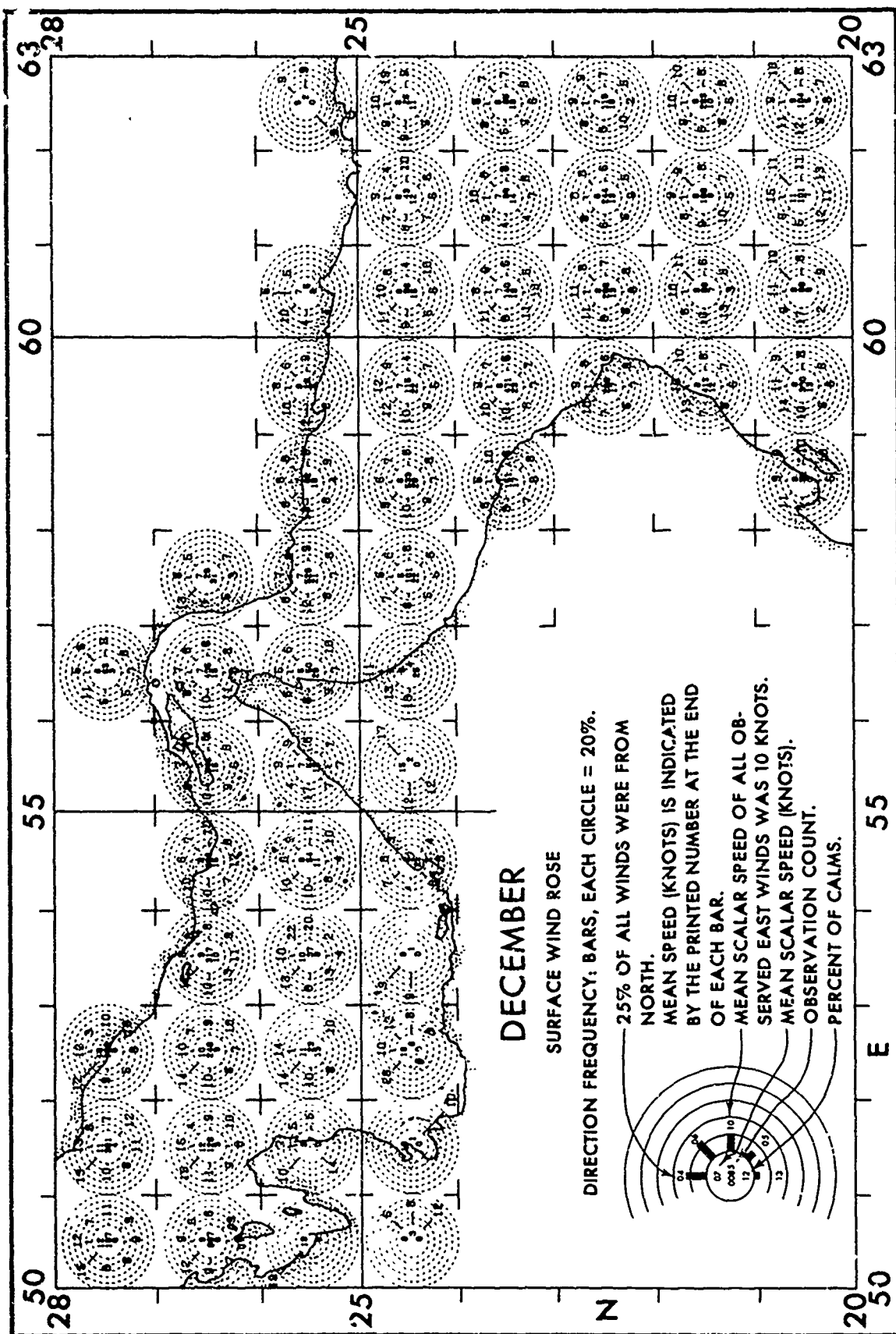


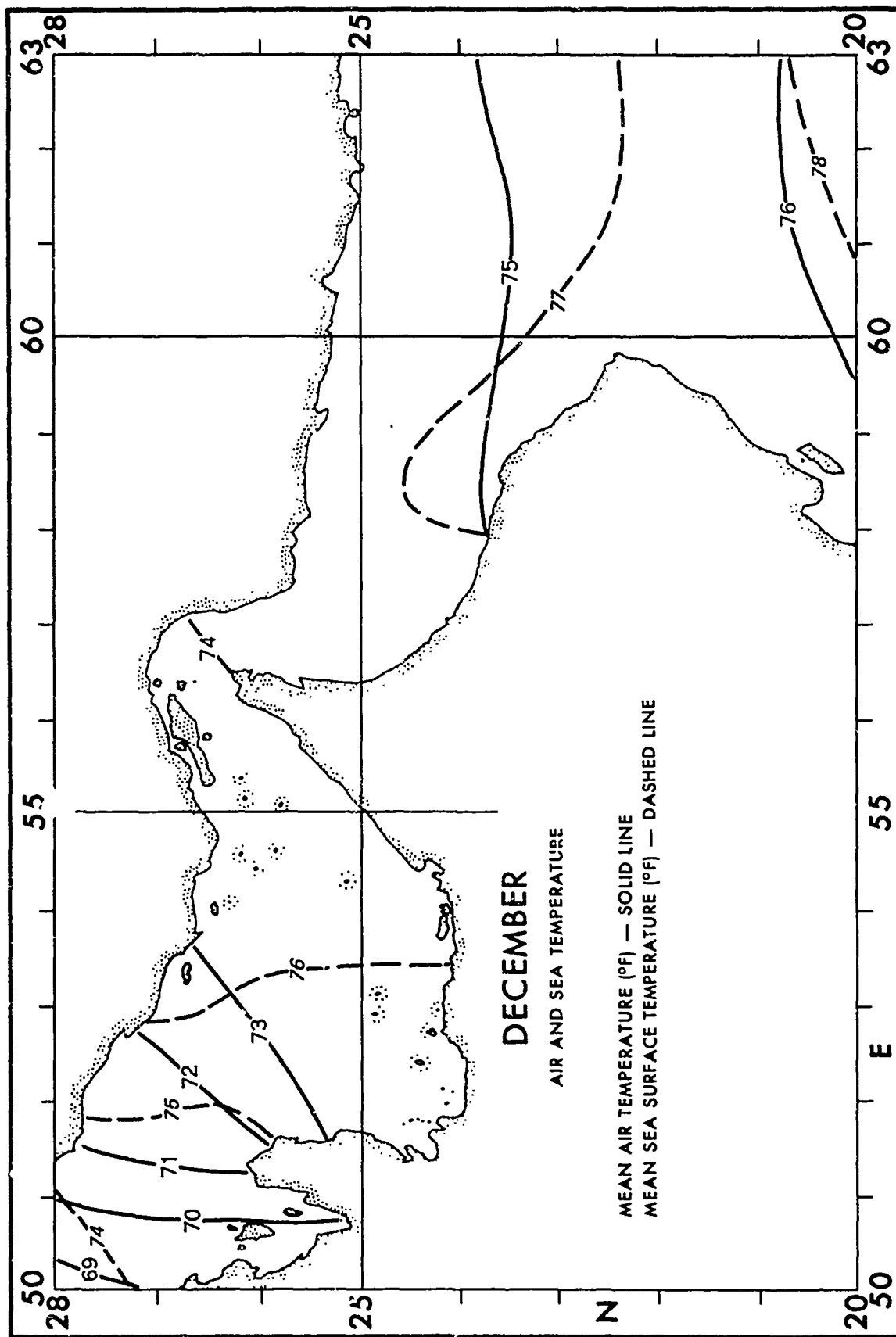


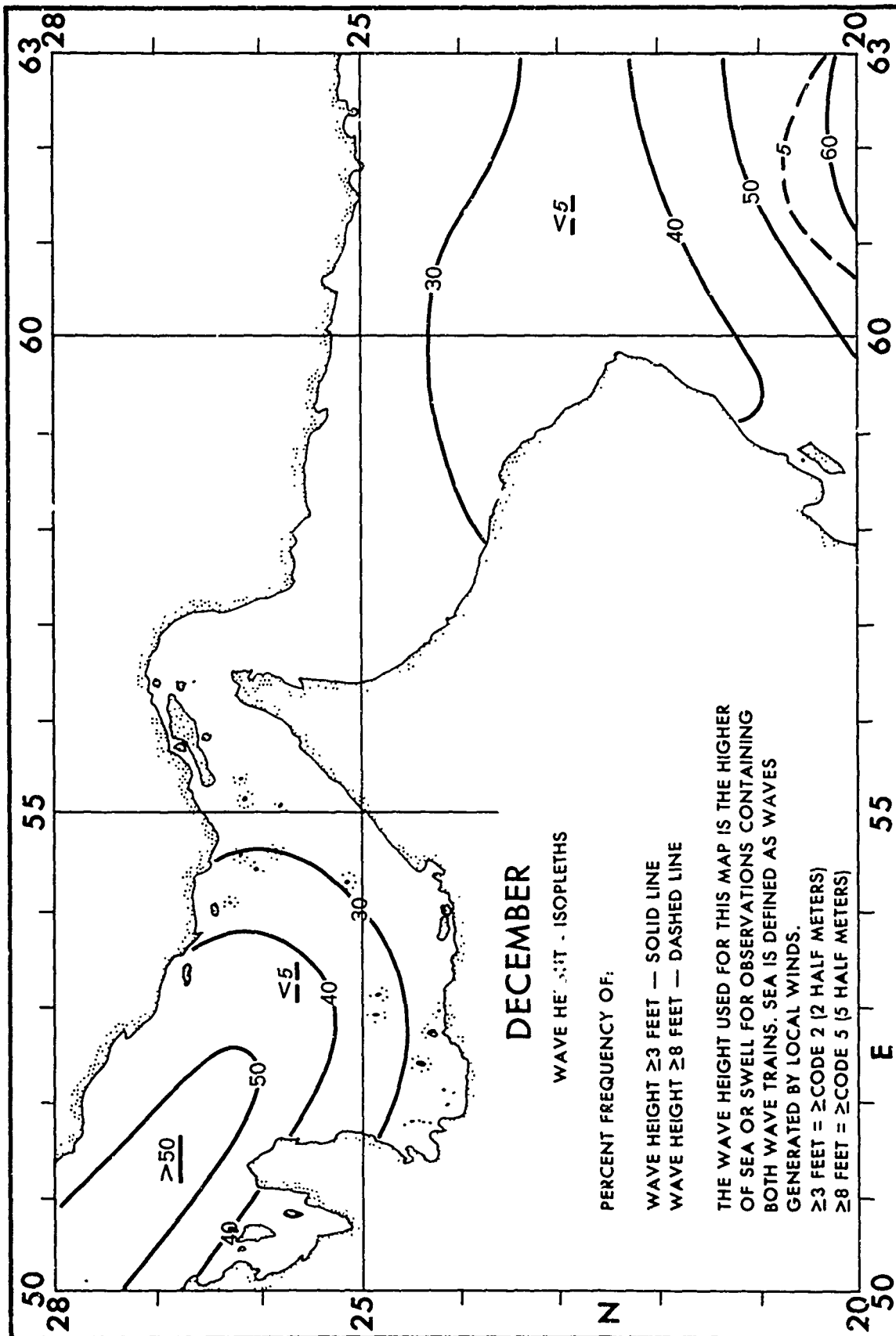


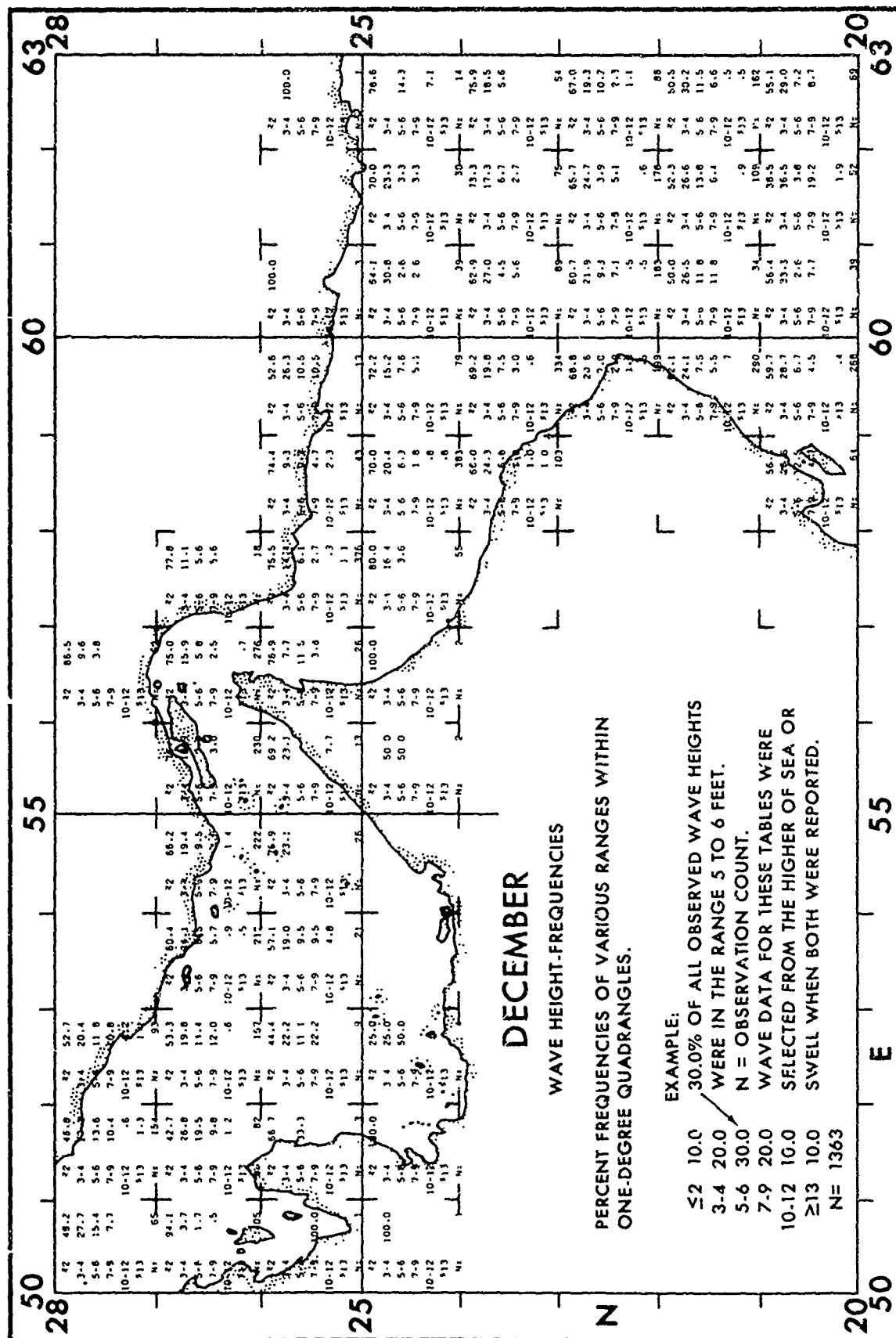








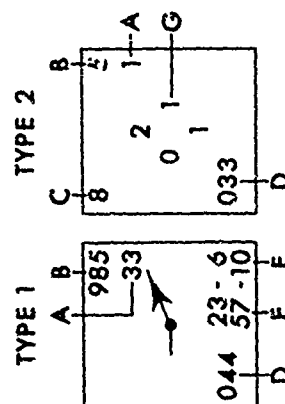




## SURFACE CURRENTS

### Data Presentation

The following legend shows two types of surface current presentations by 1° quadrangle, type 1 with 12 or more observations and type 2 with fewer than 12 observations. Where there are 11 or fewer observations within a 1° quadrangle, the total number of observations is shown within the 90° quadrant containing the observations.



A Number of calms (included in total observations).

B Total observations

C Mean speed (0.8 knot) for all observations.

D Vector resultant direction (°T) for all observations.

E Percent frequencies (57% primary direction, 23% secondary direction).

F Mean speeds (1.0 knot primary direction, 0.6 knot secondary direction).

G Number of observations by quadrant.

Type 1 - If there are 12 or more non-calm observations in a 1° quadrangle, the surface current is depicted by vector results as follows:

➤ Persistent Current - 60 percent or more of all observations fall within a 45° sector of the 8-point compass.

➤ Primary Current with Secondary Direction - Primary Current - 50 percent or more of all observations fall within three adjacent 45° sectors. Secondary Direction - 20 percent or more of all observations fall within a 45° sector, and the two resultant vector directions are separated by more than 90° of arc.

➤ Prevailing Current - 70 percent or more of all observations fall within two adjacent 45° sectors.

➤ Bizonal Flow - Practically all observations are concentrated in opposite pairs of 45° sectors, and one pair contains at least 80 percent as many observations as the opposite pair. This generally indicates variability that occurs in zones of entrainment between opposing currents.

➤ Variable Current - The 45° sector with most observations has less than 25 percent of all observations; direction is indeterminate.

